OSPREY COMBAT AIRCRAFT • 94

US MARINE CORPS F-4 PHANTOM II UNITS OF THE VIETNAM WAR

Peter E Davies

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IN THE BEGINNING

The US Marine Corps was closely involved in the development of the McDonnell Douglas F-4 Phantom II from its inception in the mid-1950s. The jet's multi-mission capability suited its requirement for an aircraft to support mobile ground forces in limited wars, the Phantom II providing better air cover for 'vertical envelopment' helicopter landings than any of its previous fighter-bombers.

Budget restrictions meant that the Marine Corps had traditionally operated ex-US Navy fixed-wing types. During World War 2, Marine Corps units took over the Vought F4U Corsair after the US Navy had declared it unsuitable for carrier operations. The Corps proved that it could be a superb fighter-bomber, resulting in its return to carrier-borne flying with several countries' navies. The Corsair went on to be the Marine Corps' piston-engined workhorse during the Korean War, although by then it had been joined by a succession of early jet fighters.

First came the short-lived McDonnell FH-1 Phantom in 1947, this machine being the first US-built jet to land on an aircraft carrier. The FH-1 flew with the US Navy's VF-171 and solitary Marine Corps unit VMF-122, led by World War 2 ace Maj Marion Carl. The Phantom was succeeded by McDonnell's F2H Banshee (effectively a scaled-up, twin-engined FH-1) and the Grumman F9F Panther, both types entering service during the Korean War.

Two fighters accepted by the Marine Corps by 1950 provided crews with experience of radar-controlled nightfighting – crucial to the service introduction of the Phantom II in the early 1960s. As sole operator of the twin piston-engined Grumman F7F Tigercat from 1945, the Marine Corps supplied VMF(N)-513 and VMF(N)-542 with radar-equipped F7F-3Ns. The aircraft scored three aerial victories at night during the Korean War and flew many nocturnal ground-attack missions.

Again, the US Navy had considered the F7F unsuitable for carrier embarkation, passing the big fighter on to Marine units. It made the same decision with the Douglas F3D Skyknight, this aircraft being deemed too heavy and underpowered for 'blue water' operations. Its crude escape system via a ventral hatch, together with a 15-second delay while its engines accelerated from idle to full power, made it unsafe aboard carriers.

Later, the F3D-2 flew with land-based VMF(N)-513, and it became the first US jet to shoot down an enemy jet at night when Maj W T Stratton Jr and radar operator MSgt Hans Hoglind destroyed a Russian Yak-15 on 3 November 1952 over Korea. Lt Col Robert F Conley, who later commanded the Phantom IIs of Marine Air Group (MAG) 11 at Da Nang AB, added a MiG-15 on 31 January 1953 – ironically, his son was killed when his VMFA-115 F-4B Phantom II was shot down by groundfire on 21 September 1968. Converted to the electronic warfare role, Skyknights were still in service with Marine Corps composite squadrons 17 years later, providing invaluable service during the Vietnam War.

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Probably the most successful jet fighter used by both US Navy and Marine Corps squadrons prior to the F-4 was the Vought F-8 Crusader. Examples began reaching the Corps in January 1956, only three months after the US Navy had received its first production F8U-1s. The aircraft gave the Corps a supersonic day fighter with missiles and guns, adding limited all-weather and ground attack capability in later versions. When US Navy and Marine Corps squadrons began to deploy to Vietnam in early 1965, it was still their premier fighter, gaining a solid reputation as a 'MiG master' and remaining in service beside the F-4 Phantom II that gradually replaced it. For the attack role, both services had relied on the Douglas A-4 Skyhawk since 1956. No fewer than 13 Marine Corps A-4 and two-seat TA-4F units would see action during the Vietnam War, sharing strike duties with F-4 squadrons.

As the Phantom II specification began to take shape in 1953, the Marine Corps was looking for an eventual replacement for both the F8U and A4D that could perform their roles in all weather conditions, day and night. It also needed a dedicated reconnaissance variant of the new aircraft. Budget limitations restricted the Marine Corps to a carrier-borne design developed and funded by the US Navy.

It took four more years to firm up the detailed F-4 specification after several quite radical changes in direction. The US Navy had ordered McDonnell's swept-wing F3H Demon in 1949, this proving to be the company's only single-engined naval design. Its poor Westinghouse J40-WE-8 turbojet delayed service acceptance until late 1956, by which time McDonnell had fitted the F3H with the more reliable Allison J71-A-2 powerplant. In its later F3H-2M guise, the Demon was the US Navy's first fully missile-armed, all-weather interceptor, and in many ways the starting point for the F4H-1 Phantom II.

The Model 98 'Improved F3H' evolved into the F3H-G/H with a Demon-like airframe and twin engines. By September 1954, when two prototypes were ordered, it had become the AH-1, a larger multi-mission aircraft capable of flying from the new *Forrestal*-class super-carriers. One of those missions was attack (indicated by the AH-1 designation), and ten hard-points were built into the airframe, as were four 20 mm guns. That ordnance capability attracted the Marine Corps, who fought hard to retain it for all-weather interdiction and close air support (CAS) – it was also a major selling point when the USAF entered the F-4 programme in 1961.

As the radar intercept mission regained priority for the US Navy, which was facing an increasing threat from high-flying Soviet bombers carrying nuclear weapons and stand-off missiles during F4H design evolution throughout 1956-57, a second seat was added for a radar operator and the Raytheon Sparrow III missile (adapted from the F3H-2M Demon's armament), with its Aero X-1A control system, replaced the guns. Missiles were lighter than guns, better for the long-range interception of threats to the fleet and easier to use since the Sparrow's semi-active guidance system was self-guiding after launch. Fuselage-mounted guns would also have disturbed the delicate radar. For closer-range engagements, the established AAM-N-7 (AIM-9B after 1962) Sidewinder was selected as secondary armament, backed by an ACF Electronics AAA-4 infrared seeker in the aircraft's nose to widen the 'vision' of the Sidewinder's own seeker.

Phantom IIs in the markings of all three services. The distant F-110A (62-12187) was built as BuNo 151004, one of 29 F4H-1s borrowed from the US Navy to initiate USAF training on the Phantom II with the 4453rd CCTW ahead of the delivery of the first purpose-built F-4Cs. BuNo 151001 in Marines markings (foreground) served with VMFA-542, and it was lost in a tragic head-on collision with a Marine Corps KC-130F refuelling aircraft on 18 May 1969. Eight Marine aviators died when the KC-130F and two F-4Bs were destroyed (*McDonnell Douglas*)

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The aircraft, re-designated F4H in 1955 following the deletion of the 20 mm cannon, showed considerable potential partly due to the fitment of General Electric J79-2 engines, each providing 15,600 lbs of afterburning thrust (17,900 lbs in later versions).

After suffering a generation of underpowered jets, the Marine Corps was promised a carrier-capable fighter with enough muscle to carry more than 22,000 lbs of ordnance, fly at speeds in excess of Mach 2 to intercept targets above 55,000 ft and provide all-weather CAS for troops on the ground. Early examples were capable of exceeding Mach 2.6, but frictional heating and airframe stability problems precluded further acceleration.

McDonnell chose the Westinghouse APQ-50A radar, used in the F3H Demon, for its new fighter. Initially, the radar had a 24-inch antenna, but this was later replaced by a 32-inch dish in a larger Brunswick radome when the radar was re-designated APQ-72. It was linked to an APA-128 continuous-wave system (also borrowed from the Demon), which fed targeting information from the radar to the AIM-7 Sparrow III missiles, passing the latter bearing and range data detected by the APQ-72 in 'search' mode. The Sparrows' own continuous-wave trackers then locked-on to a target and tracked it after launch.

With the specification settled and nearly seven million man-hours of design work already completed, the first YF4H-1 prototype (BuNo 142259) was constructed in early 1958. The aircraft made its first flight on 27 May that year, with test pilot Robert C Little at the helm. The fighter's upturned outer wing panels, drooped nose and stabilators angled down at 23 degrees elicited many wry comments, one wag claiming that it was the 'first aircraft to be built from a set of wrinkled blueprints and delivered upside down'!

The US Navy's Preliminary Evaluation began at Edwards AFB on 15 September 1958, and this included a fly-off against the Vought F8U-3, an excellent rival development of the Crusader built around the massive 25,000 lbs thrust Pratt & Whitney J75 engine. The US Navy wanted both aircraft but funding restrictions limited its choice to one, and in December 1958 the F4H-1 was announced as the future fleet fighter.

The design process for the McDonnell aircraft sought to satisfy both US Navy and Marine Corps requirements without compromising either of them. The project soon had two Class Desk Officers, Cdr Jeff Davis, representing the US Navy, and Lt Col (later Lt Gen) Thomas H Miller for the Marine Corps. The latter explained to the author;

'The Navy and Marines normally prefer to operate multi-mission tactical aircraft because of the space and support limitations when operating from ships and expeditionary airfields ashore. This does present some unique design requirements. The Navy's primary concern was for the protection of its ships at sea, while the Marine Corps' was the protection of its highly mobile forces ashore.'

While the US Navy could provide cover for shore-based Marines as long as they were within range and not subject to an overwhelming aerial threat (including nuclear weapons), land-based aircraft 'capable of defending against enemy aircraft attack, as well as providing an attack capability for the support of its ground forces ashore' were needed. Also on the Marine Corps' menu was a tactical reconnaissance vehicle to replace its F8U-1P Crusaders. The new design offered the growth

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potential for modification to reconnaissance configuration, and McDonnell had experience of similar adaptations to its F2H Banshee and F-101 Voodoo fighters.

Testing proceeded smoothly, with Lt Col Bob Barbour becoming the first Marine to fly the aircraft (christened the 'Phantom II' in July 1959 by J S McDonnell) on 6 October 1959, followed by Lt Col Tom Miller on 2 December.

With the completion of the US Navy's Board of Inspection trials in November 1960 it was time to demonstrate the aircraft's outstanding performance. Cdr Lawrence Flint had already shown that the stripped down second prototype, with extra engine thrust from water injection, was capable of reaching 65,000 ft in a zoom climb in December 1959. Further attempts at speed and altitude records were planned, and Lt Col Miller was selected for the 500 km Closed Circuit attempt.

Using the twelfth F4H-1 (BuNo 145311), he climbed to 33,000 ft, shed the empty wing drop tanks and accelerated to Mach 1.7. Releasing the large 600-gallon centreline external tank, Miller entered the course at Mach 1.76 and 48,000 ft. The F4H-1 sustained Mach 2 during its pylon turns around the course, exiting the final 'gate' at Mach 2.15 with 125 deg F on the cockpit temperature gauge and only 900 lbs of fuel remaining. Lt Col Miller decided that 'the only way to get on the ground with the engines running was a split-S manoeuvre with a near-vertical dive, speed brakes out and engines at idle power. This provided positioning for a straight-in approach to the runway at Edwards AFB. Flaps and wheels were lowered at the last minute when I knew I had the runway made, even if the engines quit. Fortunately they didn't flame out until I touched down'. During his 15 minutes 9.2 seconds run around the speed course Miller had averaged 1216.78 mph, beating the previous world record by no less than 400 mph.

Fellow Marine aviator Lt Col R B Robinson achieved a new Absolute Speed world record on 22 November 1961 when he hit 1700 mph at the end of his speed run. Finally, the Marine Corps was represented in another of the F4H-1's 15 new world records when Lt Col W McGraw broke the 9000 m and 12,000 m time-to-climb records during Project *High Jump* in 1962.

Although the US Navy's first F4H-1 was delivered to training squadron VF-121 at NAS Miramar, California, on 29 December 1960, much development work was still being undertaken. This included an 'iron bomb' demonstration at Camp Lejeune, in North Carolina, on 25 April 1961 in which Tom Miller dropped 22 dummy 500-lb bombs as proof of the jet's attack capability. Ironically, Tom had initially been 'absolutely opposed to using the F4H for anything but air-to-air' according to Capt (later Maj Gen) Hal W Vincent, who was in charge of project O/V 5 (the US Navy's development of tactics and delivery of nuclear and conventional air-to-ground weapons). He recalled;

'I brought the plane [BuNo 143390] over from VX-4 [the US Navy's test and evaluation squadron, which received its first F4H-1 in 1961] just for the Mk 7 special [nuclear] weapons evaluation. Then as a joke I hung an MCBR [multiple conventional bomb rack] on the airplane, and that's how the whole caper started.'

Vincent then cut an iron-beam MCBR in half and had it wired up to make a basic triple ejection rack (TER) for the trials with 24 500-lb

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Capt Hal Vincent (left, holding helmet) prepares to meet President John F Kennedy at Naval Air Weapons Station China Lake on 7 June 1963 during a demonstration of conventional weapons delivery. The President had recently read Maxwell Taylor's book *The Uncertain Trumpet*, which advocated a move away from sole reliance on nuclear weapons, and the demonstration resulted in funding for Hal Vincent's conventional weapons project O/V 5. Capt Vincent and his RIO Ed Edelon, with Capt Paul McCarthy (to Capt Vincent's left), flew two F-4Bs that dropped 24 500-lb bombs from each aircraft (*via Maj Gen Hal W Vincent*)

bombs that he undertook with VX-5 from February to April 1961. McDonnell circulated photographs of the installation, which aroused much interest in the fighter's ordnance-carrying potential. Such a loadout also gave the US Navy/Marine Corps a lead over the USAF in handling conventional tactical weapons delivery, which was regaining credibility partly due to pressure from President John F Kennedy, who realised that there was no credible back-up to the United States' nuclear arsenal.

Tom Miller later flew a second 22-bomb drop using BuNo 145310 as part of a US Navy/Marine Corps tactical firepower demonstration in front of several congressmen and legendary USAF commander Gen Curtis LeMay. As Lt Gen Miller recalled, 'It was the Air Defense Command (ADC) that first became interested in the F-4. At the time a Col Graham of the USAF was permitted to fly the F-4 very early in the programme, and he pushed it for ADC versus the F-106. His effort culminated in the fly-off between the two aircraft. Cdr Julian Lake was the commander of VF-74, the US Navy squadron that participated in the fly-off which showed the F-4 to be a far superior fighter'. After the live bomb-dropping demonstration Tactical Air Command (TAC) was 'so impressed by the F-4's fighter/attack capability that they stole it away from ADC, who continued to fly the F-106, while the F-4 was purchased for TAC'.

From 1 May 1961 the first 48 naval examples were re-designated F4H-1Fs, and they later became F-4As after a service-wide re-designation system was adopted on 18 September 1962. From production Block 6 (BuNo 148363 onwards), the aircraft previously known as the F4H-1 became the F-4B – the first definitive production version of the Phantom II.

The Marines received their first operational examples on 1 August 1962, some 14 months after the first two operational US Navy squadrons (VF-74 and VF-114). The US Navy's VF-101 at NAS Oceana, Virginia, trained VMF(AW)-531 'Gray Ghosts', based at MCAS Cherry Point, South Carolina, as it became the first east coast Phantom II unit in the Corps. On the west coast, VMF(AW)-314 'Black Knights' began operations at the same time at MCAS El Toro, California, following training with VF-121 at NAS Miramar.

Col James R Sherman recalled VMF(AW)-531's transition from its F4D Skyray single-seat fighters to the F-4B, complete with a radar intercept officer (RIO) aboard;

'The RIOs were enlisted personnel, many of whom flew the F7F Tigercat and later the F3D Skyknight in Korea. When the F4D replaced the Skyknight many of these enlisted RIOs went into the "air control" field, working as GCI/GCA controllers and control tower operators. With the arrival of the F-4B, many of these old professionals volunteered for flight duty and became warrant officers. This meant that it didn't take more than 60 to 90 days to bring the squadron to combat-ready status, allowing VMF(AW)-531 to deploy to NAS Key West, Florida, on 1 February 1963. It duly operated from here for several months under the control of NORAD [North American Air Defense Command], which was run by the USAF.'

This deployment took Marine F-4Bs, under the command of Lt Col Robert 'Foxy' Foxworth, close to combat for the first time. US Navy Phantom II squadron VF-41 had been put on alert at Key West in

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response to the Cuban missile crisis of October 1962, and VMF(AW)-531 replaced the unit. Although the threat had reduced by then, the squadron gained valuable near-combat time against Cuban air force MiG-17s. Maj Gen Michael 'Lancer' Sullivan was to spend 23 years with the F-4, achieving a 'high-time' record of 5000 flying hours in the jet. He recalled one scramble against MiGs probing too close to US air space;

'We were at 800 ft doing Mach 1.1 in full afterburner at three miles [from the MiGs], with an overtake speed of 470 kts. I didn't have a visual on them, so I chopped power to idle with speed brakes out and did a high-g barrel roll to keep from flying out in front of the "bogies". Luckily, we stabilised on their tail at about half-a-mile. The two MiGs went into a 60-degree port turn. I immediately thought that they had seen us, so I slid to the outside of their turn, re-confirmed that I was in Sidewinder mode and periodically I heard that beautiful "grrrrr" tone [indicating that the missile was "seeing" the target].

'We were now only seconds from being over Cuba, so I started a hard turn back towards Key West. The flight had only lasted about 25 minutes, and we landed with just 800 lbs of fuel left in the jets. Both Sidewinders came back with their seeker-head glass blurred [by heat friction].'

These missions in early 1963 were a reassuring demonstration of the F-4B's effectiveness as an interceptor, but they would rarely be repeated by Marine Corps Phantom II units during the Vietnam War.

VMF(AW)-531's first generation of RIOs learned to operate their complex rear-cockpit systems in a 17-week course run at MCAS Quantico, Virginia, with a month's pre-flight training at NAS Pensacola, Florida, and further courses at NAS Glynco, Georgia. They found that the APQ-72 radar could detect bomber targets at ranges in excess of 70 miles. Initial figures for maintenance were less impressive, however, as early F-4Bs required between 70 and 90 maintenance man hours per flight hour. These figures included the servicing of the complex full-pressure 'astronaut' suits used by crews during interception sorties flown at altitudes of around 50,000 ft. In Vietnam the majority of F-4 flying would never exceed half that altitude.

Although mastering interception techniques was a priority in the training syllabus, the Marine Corps Phantom II units worked hard at improving bombing accuracy – initially without the aid of multiple bomb racks – for their crucial air support mission. Flt Lt Jim Sawyer, an RAF exchange officer with VMF(AW)-531 in 1963, recalled;

'Dive-bombing was an uncomfortable exercise in an aircraft as fast and heavy as the F-4, and 45-degree angle bombing was even more unpleasant. Whilst flying such a sortie I initiated the pull-out and the aircraft's stability augmentation system tripped out. In those days the switch for the system was held "on" electrically, and a power trip could de-select it. The nose reared up to show me blue sky ahead,

'Black Knights" F4H-1 BuNo 149453 was photographed in flight near MCAS El Toro in July 1962, just a few weeks after VMF(AW)-314 had transitioned from the F4D-1 Skyray. The aircraft bears the AW ('all weather') addition to the squadron nameplate, and its individual number '2' near the leading edge of the tailfin. Subsequently transferred to VMFA-115, this Phantom II flew many combat missions with the 'Silver Eagles' from Chu Lai until it crashed on 19 February 1969 during a night attack exercise when elements of the squadron were sent from South Vietnam to Cubi Point, in the Philippines, for training (*USMC)*

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followed almost immediately by a view of the terrain below as the nose plunged rapidly down. It was an experience to remember.'

Marine Corps F-4 crews still undertook the the US Navy syllabus in 1969 when Gen 'Spider' Nyland trained as a RIO. 'Our tactical and NATOPs [Naval Air Training and Operating Procedures Standardization] manuals were the same – we just flew more CAS'.

The dual interception and attack roles of the new fighter brought about a change in the designation of Marine Corps VMF(AW) squadrons to VMFA (fighter attack) in August 1963. One such unit to make the change was VMF(AW)-314, whose operations officer at the time was Maj Hal Vincent. He had joined the squadron in June 1962, just as it transitioned from the F4D-1 Skyray to the F4H-1. VMFA-314 would subsequently make several Vietnam deployments in 1966-67.

Weapons technicians load AIM-9B Sidewinders and AIM-7D Sparrows onto VMF(AW)-531 F-4B-11-MC BuNo 149470 – note the early version of the squadron designation prior to it becoming VMFA-531 in August 1963. 'Most guys practiced with the AIM-7, but everyone knew that the 'winder would work', explained Gen 'Spider' Nyland. 'When a Sparrow kicked off from the airplane you could feel it drop away and hear the noise of its motor. The rules of engagement were such that there wasn't much opportunity for a head-on shot [ideal for the AIM-7] because of the need for visual identification of the target. There used to be a training requirement to live-fire one Sparrow per year. but prohibitive costs reduced this to a "captive carry" simulated launch' (*via Cdr Peter Mersky*)

With squadron commander Lt Col Bob Barbour, Maj Vincent conducted rigorous screening to ensure that the unit had the best possible pilots. He checked their instrument flying skills in a Lockheed TV-2 Seastar trainer and integrated the naval flight officer (NFO) radar operators, most with F3D Skyknight experience, into the two-man crews. They worked on 'bombing and rocketing', making ten- and thirty-degree practice attacks that quickly achieved outstanding accuracy comparable to crews on their second tours in Marine attack units.

Hal Vincent and his assistant Capt Bob Norton collated VMF(AW)-314's weapons training results and took them to Marine Corps Headquarters in Washington, D.C., where Col Marion Carl and his boss Maj Gen Norm Anderson recognised that the information qualified the Phantom II to handle virtually all the ordnance used by Marine attack squadrons. Two weeks later all Marine F-4 units received the 'VMFA' nameplate.

Capt Vincent's squadron also conducted 'carquals' for aircraft carrier operations (as did all Marine fighter crews) and qualified in aerial refuelling for long-range flights. VMFA-314 made the Marines' first transpacific F-4B deployment to NAF Atsugi, Japan, in October 1963, followed by VMFA-531 'Gray Ghosts/McGraw's Marauders' in June of the following year.

These long flights gave crews valuable, if uncomfortable, experience of in-flight refuelling and navigation that would often be used when successive Marine Corps units deployed to Southeast Asia during the Vietnam War. They were made possible by the acquisition of 46 Lockheed

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KC-130F Hercules tanker/transports, delivered to the Corps from 1960. Each aircraft could refuel two fighters at once using the probe and drogue method, although the Phantom II's normal 480 knots cruise speed had to be drastically reduced in order to match the KC-130's more sedate 200 knots, and this made for some awkward handling when plugged into the basket. Indeed, the pilot had to use minimum afterburner on one of the F-4B's engines to keep the fighter under control as its tanks reached maximum capacity and its angle-of-attack increased to near-stalling point.

The early F-4B 'transpac' deployments involved 15 aircraft supported by six KC-130Fs from VMGR-352, whose crews flew up to 15 hours per day to replenish the thirsty Phantom IIs.

In Japan VMFA-314 flew air defence alert missions, Capt Jim Sherman recalling;

'We provided the primary air defence for Japan, and at that early stage in the Phantom II's career with the Corps we still had the "all-weather fighter" mentality as we didn't receive bomb racks for the jets until September 1964. Accordingly, we conducted about half of our normal training at night, and complained when a night sortie was cancelled for lack of aircraft or weather.'

Crews explored the upper limits of the aircraft's interception envelope, reaching altitudes of 66,000 ft with a clean F-4B and flying an emergency intercept of a lost Japan Air Lines Boeing 707 despite there being 18 inches of snow on the ground at Atsugi. However, the APQ-72 radar was still an immature system at this point, and it was not unusual for VMFA-314 to have only four or five of fifteen squadron aircraft with fully serviceable radars on the morning flightline. The APQ-72's vacuum tube technology also meant that radars and radio transmitters took five minutes to warm up, which meant that the electronics in aircraft assigned alert duty had to be kept running in order to meet the three-minute takeoff target.

Although APQ-72 was, 'when working, a very good airborne interception radar' in the opinion of RAF exchange pilot Gp Capt Mike Shaw, 'its reliability was not too good. Of the 15 F-4Bs assigned to the squadron [VMFA-323], three were in "B" status undergoing deep servicing. We could usually count on eight jets being "up" for flying on the line each morning, but only four of them would have fully serviceable radar'.

In a typical Marine Corps Phantom II squadron, company representatives from Westinghouse and Raytheon were kept busy rectifying faults in about half of the unit's Aero 1A radar systems after each mission. This situation persisted in varying degrees throughout the F-4B's wartime service, but the majority of its combat missions did not require the crew to use the Phantom II's interception capability in any case. Improvements eventually came with the solid-state AWG-10A/B fire control system fitted in the upgraded F-4J variant.

In August 1964 VMFA-323 'Death Rattlers' became the first Marine Corps unit to transition from the F-8 Crusader. The squadron's experience with the Crusader had included the extraordinary survival of Lt Cliff 'Jud' Judkins, who fell 15,000 ft into the Pacific when both his ejection seat and parachute failed in June 1963. The fighter had exploded with ruptured fuel tanks after being over-filled during an in-flight refuelling.

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VMFA-323's 'Boss bird' is seen on short finals for landing in an early version of the unit's 'rattlesnake' scheme. This F-4B-15-MC was one of four eventually exchanged by the 'Death Rattlers' with VMFA-115 in May 1967 for four of its aircraft. Early F-4Bs such as this jet had the AAA-4 infrared seeker head mounted beneath the radome as a means of making a passive interception without using radar. Improvements in the performance of the AIM-9 Sidewinder and low utilisation of the AAA-4 caused it to be deleted from the F-4J (*J T Thompson*)

Conversion to the F-4B at Cherry Point introduced the squadron to 'an entirely new concept in aerial warfare' according to one of its new RIOs, Lt Raymond Dunlevy.

Fifteen of the Marine Corps' 19 fighter squadrons eventually exchanged their Crusaders for Phantom IIs, although four of these units continued to operate the F-8E from bases in South Vietnam until their transition to the Phantom II – VMF(AW)-235 'Death Angels' was the last to convert in May 1968. For a generation of single-seat fighter pilots the move to a two-seater was not always easy.

Col Denis 'Deej' Kiely flew most of his combat missions in the F-8E and RF-8A, commencing with some of the first *Yankee Team* reconnaissance sorties from USS *Kitty Hawk* (CVA-63) in 1963-64. He remained a 'proponent of the single-seat fighter' but eventually transitioned to the F-4, an experience that he likened to 'going from a Ferrari to a dump truck. At first the RIO was a needless distraction, and I didn't like flying "by committee". Gradually, however, I became accustomed and, as we teamed up individual pilots and RIOs, we began to think and react alike with very little conversation. Objectively, I didn't like having another guy in the airplane when it came to taking a chance. If I was going to do something dangerous I didn't want to take someone with me. In some ways, until I became more accustomed to having a RIO, I found it detracted from my aggressiveness'.

However, Col Kiely still found much to recommend the F-8. 'During the war, I would have preferred the Crusader hands-down to the Phantom II. However, from my later long experience in the F-4, especially in the late 1970s as the aircraft underwent a number of improvements, I grew to respect the ruggedness, brute power and greatly improved ACM performance. Looking back, I'd have to say that my selection of the F-8 or F-4 during that period would have been a toss-up'. There were certainly many occasions in combat when four eyes were better than two for detecting targets and threats.

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TO BATTLE

While crews from VMFA-531 practised interception and bomb or rocket passes from Atsugi, the political situation in Southeast Asia continued to deteriorate. However, the training time in Japan was not without incident either. On 31 July 1964, after suffering a double engine failure, Capt Bob Hanke steered F-4B BuNo 151460 away from a populated area before ejecting (along with his RIO CWO3 F H Schwartz) as the aircraft entered a vertical bank at 200 ft. His parachute had not fully deployed when he hit the ground, breaking the pilot's back, although Hanke survived. Capt Ray Hanle was more fortunate when his ordnance-laden F-4B pitched up and stalled in a 20-degree bank. RIO CWO David Fuller ejected but Hanle's seat malfunctioned. He was able to regain control of the Phantom II and landed it safely at Cubi Point, in the Philippines.

It was the F-4B's air-to-air capability that first took the 'Gray Ghosts' to Vietnam in 1965. The 921st Fighter Regiment of the Vietnamese Peoples' Air Force (VPAF) had MiG-17s in service from August 1964, with MiG-17PF nightfighters and MiG-21F-13s arriving in-country in 1965. It had also received 12 Il-28 'Beagle' bombers from China by May 1965. These posed a credible threat to Marine Corps activities in South Vietnam, and VMFA-531's experience during the Cuban missile crisis and its already-impressive average of 500 Phantom II hours for most of its crews made it the ideal unit to provide air defence.

Lt Col William C McGraw Jr received short-notice orders to transfer 15 F-4Bs from Atsugi to Da Nang AB, South Vietnam, on 10 April 1965. Within a few hours he led four 'EC'-coded Phantom IIs directly to the South Vietnamese base, which was 'desolate and dilapidated, with a single runway and two parallel taxiways' at the time, according to Col Jim Sherman. There were three hangars, one of which was used by the Vietnamese Air Force (VNAF) and another reserved for transient aircraft. Using what the squadron diarist called 'squatters' rights', 'the "Gray Ghosts" confiscated the third hangar and the area next to it, where we stored our ordnance'. Personnel were accommodated in tents a quarter of a mile away. Another 11 F-4Bs departed via Cubi Point using 'Chieftain' call-signs two hours later, their crews still wearing inappropriate orange 'peacetime' flight suits.

Two days later all squadron personnel and eight KC-130F tankers from VMGR-152 were in place at Da Nang, only 90 miles below the demilitarised zone (DMZ) and 60 miles from Laos – within range of VPAF aircraft. VMFA-531 was the first Marine Corps squadron equipped with jets to deploy to war since the Korean conflict.

During its two months at Da Nang, the unit pioneered many of the tactics that were to be used on a daily basis by future Marine F-4 squadrons in-theatre, including escort for troop-carrying helicopters, preparation of landing zones for the insertion of Marine patrols (LZ prep), night bombing using flares for illumination and, above all, CAS. They also flew

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combat air patrols (CAPs) and provided fighter cover for the recovery of downed aircrew (ResCAP). Adaptability was vital, for the type of mission required could change at very short notice, depending on the tactical situation on the ground.

VMFA-531 flew its first sorties two days after its arrival, and typically the missions involved ground attack rather than interception. Twelve F-4Bs were launched against the first of many 'suspected Viet Cong (VC)' villages in 'Happy Valley', only 17 miles from Da Nang. The jets' 2.75-in rockets caused fires in a number of structures, but their forward air controller (FAC) was unable to report any substantial results.

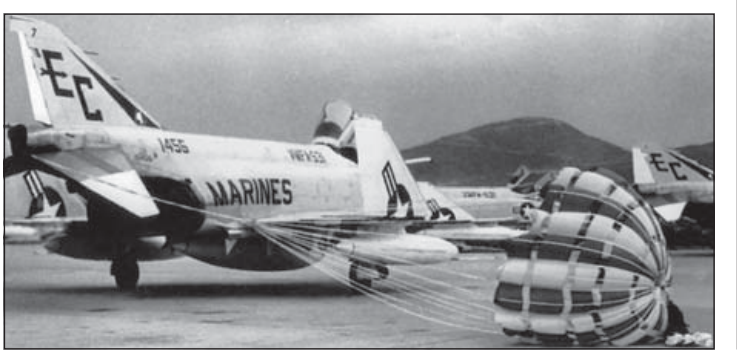
Capt Sherman, whose first combat mission saw him expending live ordnance from a Phantom II for the very first time, led a second strike against a VC-occupied village that evening with a 'division' of four F-4Bs, each carrying six pods of 19 2.75-in rockets. This, or a 'section' of two aircraft, became the standard number for most missions after several near mid-air collisions over the target with larger formations. About 100 VC had destroyed an Army of the Republic of Vietnam (ARVN) vehicle, and a FAC pinpointed a collection of grass huts that he believed were occupied by the enemy fighters.

As the F-4Bs pulled up for a shallow dive attack, the FAC reported numerous VC running from the huts into nearby rice fields. 'I had my switches set for "rockets – salvo"', Capt Sherman recalled, 'so I turned on my master armament switch and when I was less than 300 ft from the VC, and at an altitude of just 50 ft, I fired all 108 rockets at once'.

The squadron lacked mechanical bomb-loaders for the F-4Bs' newly acquired, six-bomb MER and three-bomb TER racks, so two MJ-1 loaders were borrowed from the USAF squadrons at Da Nang, although these were rapidly worn out such was the mission tempo at this time. The fallback was Marine 'muscle', with groundcrews relying on 'hernia bars' attached to the fuse sockets at either end of each bomb when uploading ordnance to aircraft as quickly as possible, despite the sweltering heat. Lt Col T J Lyman of VMFA-323 recalled that 'everyone jumped in to load ordnance, including the aircrews and office workers'.

One 15 April mission by eight F-4Bs required 33 250-lb Mk 81, 500-lb Mk 82 and 1000-lb Mk 83 bombs to be uploaded fast, but they were all expended with unknown results once again – this was the first time the Marine Corps had employed low-drag Mk-series ordnance. VMFA-531 was soon faced with a critical shortage of bombs, which forced Lt Col McGraw to 'borrow' USAF M117 demolition bombs. Lt Col Lyman explained that 'they were used as bunker busters, especially in the marshy areas. Whirlpools would mark a cave filling up. There were many caves at the waterline'.

A four-aircraft strike on 16 April had only nine Mk 81 bombs and six Zuni rocket pods for the entire division, which in turn meant that only minor damage was inflicted on a temporary bridge that VMFA-531 had been sent to attack after a



Lt Col William C McGraw led the first wave of four 'Gray Ghosts" F-4Bs from Atsugi to Da Nang as soon as deployment orders were received on 10 April 1965. With 'Chieftain' call-signs, a total of 15 F-4Bs made the journey to establish the first Marine Corps Phantom II deployment to Vietnam, commencing combat operations with a 12-aircraft strike near Da Nang on 13 April. F-4B-15-MC BuNo 151456 was later converted into an F-4N and continued in service use until September 1983. The 16 ft diameter braking parachute was normally used to save overheated brakes. (*USMC*)

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690-mile flight. With bombs and rockets in such short supply, crews were instructed to bring unused ordnance back to base rather than jettison it. The Phantom IIs had to cope with the additional landing weight by making flared recoveries at Da Nang. Things got so bad that at one point in the deployment the squadron ruled that Aero-7D and LAU-10 rocket pods would not be expended 'unless in direct support of Marines', rather than ARVN or other US forces.

When VMFA-531 first deployed to Da Nang in 1965, the event elicited headlines such as 'Deadly Phantoms Haunt Reds in South Vietnam'. Like the Marine Corps F-8 Crusader squadrons that flew with them, the F-4B units performed mostly air-to-ground rather than air-to-air missions. Both were developed as interceptors, although like the Phantom II, the Crusader also had substantial air-to-ground capabilities (*John Krill*)

On 18 April VMFA-531 embarked on CAS, the core mission for the Marine Phantom II squadrons' effort in Vietnam. Eight aircraft, each carrying six Mk 81s were directed by a FAC(A) against 100+ VC who had destroyed an ARVN personnel carrier south of Da Nang. Ordnance was dropped in 30-degree dives with only small-arms opposition. Two more divisions of F-4Bs followed up with 5-in Zuni projectiles and 2.75-in rockets.

At Da Nang the single runway and lack of diversionary airfields could ruin a return to base if the runway was blocked. Col Sherman recalled;

'On one occasion a troop-carrying Boeing 707 blew several tyres on landing. The pilot shut down on the runway for an hour. Meanwhile, two F-4Bs landed over the top of him (he claimed the jet-wash shook his aircraft) and another pair landed the opposite way, head-on to the Boeing, which the pilot thought even more scary. The last two landed on the taxiway, which was only 75 ft wide in places.'

From 19 April VMFA-531 crews benefited from the installation of arresting gear at Da Nang by a team of engineers flown in from Iwakuni. This equipment was vital in the stopping of aircraft that returned to base with hydraulic failure. A pilot could use the arrestor gear fitted to his F-4B to hook the aircraft carrier-type cable positioned across the runway. It saved numerous F-4s, each worth $3.9m in 1965 currency, from severe damage or complete loss.

Da Nang was located in a VC-controlled area of South Vietnam, and heavy perimeter defences for the airfield had been set up prior to VMFA-531's arrival. F-4B units often attacked targets within sight of the airfield, dropping their ordnance almost immediately after takeoff.

The squadron initiated additional, vital, mission profiles almost daily. On 19 April VMFA-531 flew the first escort mission for Marine helicopters when Maj Keith Smith and CWO Ken Strayhorn, with 1Lt James Gress and CWO-1 John Cummings, protected UH-34D troop-carrying helicopters. This role had previously been filled by piston-engined T-28 Trojans, which could fly at helicopter speeds, but accelerate ahead to fire on the intended landing area. However, F-4Bs flying at around 330 knots had to fly 'racetrack' patterns to stay with helicopters capable of little more than 100 knots.

CWO Cummings, who was subsequently commissioned, later participated in the only Marine Corps F-4 MiG kill in September 1972.

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Three years prior to that, whilst serving as an instructor, he helped in the development of improved fighter tactics that saw an enhanced role for the RIO in crew coordination for air-to-air engagements.

On a typical in-country mission on the afternoon of 2 May 1965, 1Lt Hanke and CWO Schwarz of VMFA-531 made six passes with F-4B EC 12 against a VC weapons depot, dropping Mk 81 bombs and firing 2.75-in rockets in 33 degree dives from 9000 ft at a speed of 360 knots. These attacks were opposed by some 0.50-cal machine gun fire, but EC 12 (and EC 2, which led the mission) returned safely to Da Nang. (*via J T Thompson*)

Four rocket-armed F-4Bs were initially used by VMFA-531 for 'helo escort' and 'LZ prep', as Jim Sherman explained;

'As the helicopters approached the landing zone, two F-4Bs abeam of them fired rockets into possible targets in front of the UH-34s, while the last two jets, coming in from the sides, fired into the area on either side of the helicopters and behind them as they flared for a landing. Initially, it scared the hell out of the helicopter crews to have rockets impacting all around them as they landed, but they never had a shot fired at them while we were on the scene.'

This tactic, sometimes known as the 'pork chop' pattern, could be supplemented by air-dropped tear-gas dispensers or bombs to disable booby-traps in the area. The first LZ prep, on 27 May, opened up a landing site only seven miles from Da Nang. Some LZ prep patterns used three Phantom IIs arranged equidistantly in a 'wagon wheel' around the descending helicopters. One aircraft could thereby point its nose at a threat within seconds, and keep heads down with rockets or high-speed passes at low altitude. As Gen 'Spider' Nyland commented, 'it didn't look too different to bombing on the range at MCAS Yuma. The tactic might change, depending on the threat. If Lead was going to make two runs and his No 2 was making just one, you might vary the run-in heading in coordination with the FAC, but there was an awful lot of "circling of wagons"'. The squadron completed more than 150 LZ prep missions during its first Da Nang tour.

These missions required particularly accurate timing and precise delivery of ordnance due to the proximity of 'friendly' forces. For example, a 28 May LZ prep for a special forces operation against a VC training camp in mountainous terrain required a barrage of 2.75-in rockets exactly ten seconds before Lt Col Ewers' HMM-163 helicopters landed. He subsequently reported, 'The assault landings were preceded by 90 minutes of preparatory air attacks by F-100, B-57 and F-4 aircraft. Timing and coordination of the attack aircraft was difficult, and of critical importance. VMFA-531 had the most difficult and important task to perform – the neutralisation of the LZ deep in a narrow canyon where two VC companies were known to be patrolling. Their conduct of the mission was superb, with every attack being precisely on target'.

A later development, euphemistically called the 'hot circle', required F-4s to drop napalm around a suspected VC village, forcing the enemy troops into the centre of the ring of fire, where they would then be hit by other ordnance, followed up by a helicopter-borne troop insertion.

Later in the war, when the focus moved to well-defended areas like the A Shau Valley in northwestern South Vietnam, tactics changed again. 'Spider' Nyland recalled 'A Shau always seemed to have a lot of guns and the "wagon wheel" went out of the window. You'd be jinking on the way

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into the target and on the way out'. Multiple runs at the target were also rare in Laos. 'Some of the targets would get pretty hot. I can recall letting all the bombs and rockets go in one 45-degree dive, pulling out and departing the target'.

FLARES AND FLAMES

Night-time ordnance delivery illuminated by flares was one of the most challenging missions demanded of the F-4B crews shortly after their arrival at Da Nang. Col Sherman was one of five former A-4C Skyhawk pilots in the squadron, and they took the initiative at night. 'We were comfortable under the flares, and some of the RIOs had flown under flares in Korea. After a series of lectures the "attack guys" would take a "fighter pilot" wingman and go out in the dark. In general, the RIOs didn't mind it because they felt that what you can't see won't hurt you!'

Sometimes a more pragmatic approach to night attack was appropriate. One night a section of 'attack types', including Col Sherman, was diverted to meet up with an airborne FAC about 50 miles from Da Nang. The FAC, on a routine transit flight, had taken a storm of small-arms fire from a small valley, and he repeated the hazardous over-flight for the benefit of the F-4 crews, this time with his navigation lights on to draw more ground fire.

'My wingman and I set up a racetrack pattern at 8000 ft and dived on the valley', recalled Sherman. 'When the enemy opened fire on one of us we aimed at the greatest concentration of ground fire and dropped a pair of 500-lb bombs. The wingman used the lead aircraft's bomb blast to roll in on, and refined his aim point on the heaviest ground fire. As I made my second run and they opened fire I could see dark spots in the muzzle flash pattern where our previous bombs had hit. I picked a bright spot in the flashes and released another pair of bombs.

'Without external lights we were depending on our radars to keep sight of one another, and it wasn't working out too well so I directed turning on our lights when clear of the target and switching off again when rolling in on the target.

'On each bomb run there was less and less return fire, and by our sixth and final run it was only minimal. They obviously didn't realise that if they hadn't fired at us we wouldn't have known they were there.'

Such an aggressive VC response to the aerial threat posed by VMFA-531 was uncharacteristic for these early days. Often, the mere presence of F-4Bs overhead would deter them from firing back. One US Army report, praising the accuracy of the Phantom II strikes, noted that enemy soldiers were 'terribly afraid when they heard the F-4 coming. It makes a tremendous amount of noise, and this seemed to terrorise the VC'. They thought of it at first as a species of fire-breathing flying dragon, or 'con ma' (ghost). For the F-4B crews, the comparative lack of ground fire enabled them to concentrate harder on accurate weapons delivery. However, small-arms fire was effective at distances up to 1500 ft, and the increasing number of 0.50-cal machine guns in the area could severely damage an F-4 at altitudes up to 4000 ft, should rounds strike vital areas.

Another variation on collaborative night air-to-ground operations saw the F-4B crews operating alongside AC-47D 'Spooky' gunships. Typically, an ARVN officer aboard the AC-47D liaised with ground forces via FM radio, and one night he reported a large enemy force crossing a river

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80 miles south of Da Nang – the first sighting of uniformed NVA troops in South Vietnam. The aircraft made two flare-dropping runs over the target, marking it for the F-4Bs and their 500-lb bombs.

VMFA-531 also worked with USAF C-130 flare-ships from 28 May, Col Sherman leading a two-ship night attack to relieve an ARVN outpost surrounded by North Vietnamese troops on this date. The Phantom IIs entered an orbit at 20,000 ft within FM radio range of the position, and the C-130 pilot soon reported that a large NVA force was about to cross a river to attack the South Vietnamese position. He began a flare-dropping run, placing the F-4Bs five miles to his rear.

'He would relay to us the enemy's position in relation to the eight flares', Col Sherman explained. 'When the flares illuminated at 5000 ft the observers on the ground radioed that the heaviest troop concentrations were between flares two and three and five and six. We were cleared "hot". We each dropped our six bombs, with a delay on the "intervalometer" of about 300 ft for bomb impact, and then climbed back to 20,000 ft.

'The C-130 reported that the ground observers were delirious as bombs were on target, with many, many NVA killed, and they asked us to remain on station for another 20-30 minutes to see if the enemy would come to retrieve their dead and wounded'. The observers soon reported too that numerous NVA had re-entered the water. After three minutes the Phantom IIs returned for a second attack. 'The results were just as spectacular as the first time'. Enemy casualties were reckoned to be more than 600 dead.

Many of these night missions had to be flown in marginal visibility, under low cloud cover and often in mountainous terrain. The requisite quick response to ambushes and sudden enemy attacks also left little time for briefing, and relied on good knowledge of the terrain by both F-4 crews and FAC pilots. Many missions were scrambled against reported 'VC strongholds', but the elusive enemy was forever moving. Two F-4Bs were called to attack such a target on 24 April, but the FAC could only see a herd of water buffalo. However, these animals were regarded as 'VC motor transport' and four pods of 2.75-in rockets were launched their way! At least it made a change from the 'damage unknown' verdict on many missions at that time, particularly when suspected targets were under tree cover, or (as on 26 April) inside caves like those in the cliffs near Qui Nhon.

The least rewarding missions were those aborted due to bad weather, or because the tactical situation changed too quickly. For example, the only outcome for a long 30 April flight to a cancelled target was the expenditure of 29,000 gallons of jet fuel.

Far more satisfying were missions such as a CAS scramble on 14 May, the first of its kind for VMFA-531. Capt P G Collins reported that his 3rd Marine Division patrols were receiving intense small-arms and automatic weapons fire from VC who were dug into positions surrounding the ridge that the Marines were occupying. Although a casualty evacuation helicopter had already been driven off by VC fire, two Marine Corps UH-1Bs remained in the area to act as airborne controllers and radio relay for VMFA-531 strikes with bombs, rockets and napalm.

Collins later reported that three F-4Bs 'silenced two automatic weapons with direct bomb and napalm hits, reducing the remaining VC fire from

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these areas to an insignificant level. The Phantom IIs then provided direct CAS for the patrol itself on the ridge by completely working over its northern slope. Expending ordnance as close as 60 to 80 ft from the patrol, with pinpoint accuracy, the Phantom IIs, using napalm and rockets, succeeded in killing several VC and driving others out of their entrenchments into our line of fire. This was accomplished by the F-4Bs despite the close proximity of surrounding high terrain and heavy smoke. The sole contributing factor enabling our patrols to withdraw with a minimum of casualties was the prompt and accurate CAS flown by VMFA-531'.

Marine Corps Phantom IIs would fly many similar missions during the war, although they were often unable to acquire such detailed Bomb Damage Assessment (BDA). Sometimes an airborne FAC could fly close enough to see through the jungle canopy and observe results. Lt Col Bruch, a FAC(A) on a 20 May strike, noted that the 'Gray Ghost' F-4Bs had dropped all their ordnance on the pin-point coordinates he had provided, and the flight leader later heard that, '"Chieftain flight" did the best bombing he [Col Bruch] had ever seen in Vietnam'.

Dropping within very short distances of beleaguered forces was quickly accepted as ground commanders became increasingly aware of the skill of the F-4B pilots – all the more remarkable since their aircraft lacked advanced bombing avionics. During one May 1965 strike a platoon commander radioed that the concussion of Mk 81 bombs falling within 50 ft of his encircled position had blown his men off their feet, but he asked for the strike to continue as the ordnance was exploding directly in the enemy's location.

Working so close to the enemy brought its own toll of damage to aircraft from their own weaponry – engine damage from ingested rocket fragments was a common problem. 'Chieftain 22' (F-4B EC 1 – aircraft nose-numbers rather than Bureau numbers were normally used for identification) sustained damage to a leading edge flap and TER when a Zuni pod came loose during an attack dive. F-4B EC 11 sustained damage to its wing and a burner can actuator oil line when a Mk 81 bomb exploded 150 ft below the aircraft after leaving its TER. A faulty fuse was a possible factor in this accident, and in the loss of several other Marine Corps F-4Bs and A-6A Intruders. Col 'Deej' Kiely recalled;

'Use of retarded weapons [Mk 81/82 SE Snakeye with fold-out tail "airbrakes" to slow the bomb's drop trajectory] was restricted to in-country flights, mainly CAS. The bombs were set up on the ground for either "slick" (un-retarded) or "Snake" (retarded). Use of electric fusing and the AWW-1/4 selector gave the pilot an in-flight option for retard or slick, but the electric fuse was universally disliked and distrusted by pilots.'

1Lts George Perry and Richard Morrissey had to eject from their VMFA-323 F-4B (BuNo 152218) on 10 January 1966 after one of their bombs exploded prematurely rather than on its target near Phuoc Binh.

BOMBING BLIND

Innovations by the 'Gray Ghosts' continued on 25 April 1965 when Capt Don Hanna and CWO-1 John Wenrich, with Capt Ronald Dusse and CWO-2 James Sewell, flew the first CAS scramble from the hot-pad alert. Two days later the first radar-controlled TPQ-10 sortie of the war was flown

Groundcrew fit a 370-gallon Sargent Fletcher external tank – identified by its central seam line and more curved profile compared with the later Royal Jet type tanks – to BuNo 151004/ EC 6. Most missions were flown with two wing tanks or with ordnance on all wing stations. Some squadrons used the 600-gallon centreline tank later in the war, including VMFA-323 in March 1969. This configuration meant that only low-drag bombs could be hung on the inboard TERs to avoid collisions when the Snakeye fins on the high-drag bombs extended. Wing tanks were often in short supply, and they usually stayed on the aircraft for long periods (*John Krill*)

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by VMFA-531 aircraft using computer equipment operated by Marine Air Support Squadron 2 (MASS-2), which had just arrived in theatre.

The F-4Bs flew a straight-and-level course to exact speed and altitude parameters provided by the radar crew, who 'fixed' individual Phantom IIs in a narrow radar beam and gave pilots a 'mark' command signal to drop their ordnance. This mission was intended to calibrate the TPQ-10 system, but the F-4Bs scored two direct hits on the Hill 393 target, although other results were unobserved. The Marine Corps operated three Air Support Radar teams for the helicopter-transportable TPQ-10 units. Many Marine Corps A-4 Skyhawks had their autopilots linked to the equipment for completely automatic 'hands off' bombing.

TPQ-10 was derived in the early 1960s from the Korean War-vintage AN/MPQ-14 ground-directed bombing system originally designed to control 'Loon' radio-controlled pilotless aircraft and their manned successors. Col Victor H Krulak, as chief of staff of the 1st Marine Division, arranged its combat introduction in July 1951, and the system was used by Marine nightfighter units – including VMF-513 – with considerable success for missions including CAS.

Most TPQ sorties were flown above overcast that obscured targets, so assessment of damage was difficult unless secondary explosions were seen, or ground observers could subsequently survey the site. Target choices were based on clear-weather reconnaissance data, although AAA sites and troop concentrations could be moved before a TPQ strike was mounted. Problems also arose from errors in the exact location of target coordinates, sometimes due to the lack of accurate local maps. Lt Gen Victor Krulak later acknowledged that some civilian casualties could have resulted. Whatever their outcome, many TPQ missions were regarded as useful assaults on VC morale.

As Lt Col McGraw commented after the first night TPQ on 10 May with 'Lancer' Sullivan against a concrete bunker complex, 'Regardless of the damage, this is considered to be a good night harassment in that aircraft are dropping from 20,000 ft and cannot be seen or heard. Twelve bombs dropped in a VC area will ruin their whole evening'. Several night TPQs later in the month had to be abandoned when the guidance radar lost its lock due to local thunderstorms or because the jets were flying at altitudes below the radar's coverage.

Aircraft or ordnance shortages often restricted the number of F-4Bs committed to TPQ/MPQ to one or two jets. Occasionally, TPQ operators had too many strike flights diverted to them, resulting in some aircraft having to be turned away. A 31 May mission included only F-4B 'Chieftain 51' (BuNo 151454), from which Lt Dusse and CWO Stowell released just two Mk 81 bombs on a 45-minute night MPQ. When ordnance stocks were rebuilt, F-4B squadrons such as VMFA-542 'Bengals' hauled 18 500-lb bombs (six on the centreline and three on TERs suspended from the four underwing pylons) for missions below the DMZ. A more normal load for the F-4 during daytime operations was about 5000 lbs of ordnance, compared with 3000 lbs for an A-4 Skyhawk.

Radar bombing usage increased as the war progressed, and during the monsoon season, when visual bombing was disrupted by weather for months, many crews were scheduled to fly two TPQ sorties of up to 1.5 hours every night for several weeks. Col Kiely found that 'TPQ missions

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and the USAF's *Combat Sky Spots* were boring, and in the case of the latter could be dangerous. The TPQ-10 used by the Marines up in I Corps took you barely into North Vietnam. You had to fly a precise heading and altitude and hold 290 knots indicated airspeed. The TPQs were used for what, in the "grunt" [Marine ground forces] trade is known as "H&I" – harassment and interdiction, meaning it was "busy work" keeping the enemy away from trails or routes south, and generally interrupting their sleep'.

From 1966 to 1971 MASS-3 teams controlled 38,010 TPQ-10 missions, dropping 121,000 tons of ordnance on more than 56,500 targets. TPQ-10 played a part in virtually all major Marine Corps aerial operations during the war, and it was even used to guide VMCJ-1's RF-8A photo-reconnaissance aircraft to some of their targets.

At the end of April 1965 VMFA-531 reasserted its air-to-air credentials with practice intercept sorties flown by 'Lancer' Sullivan and CWO Charles Taylor with USAF 2nd Air Division radar control, later replaced by a control unit run by Marine Air Control Squadron 7 (MACS-7) to provide the Marine Corps with its own highly efficient air defence radar net. However, the majority of the squadron's 233 combat sorties during its first month at war were flown to satisfy 2nd Air Division's requirements, rather than in direct support of Marines. Air-to-air sorties were hardly ever launched, except to fill in occasionally for US Navy F-4B squadrons on Seventh Fleet CAPs offshore at night. In 1967 VMFA-323 kept its interception skills alive by scrambling to meet F-4s returning from missions.

May 1965 extended the squadron's pioneering activities further still. A ResCAP for the pilot of a downed USAF RF-101C Voodoo was attempted on 6 May when four VMFA-531 F-4Bs accompanied a flight of F-105D Thunderchiefs, delivering Mk 81 and Mk 82 bombs and LAU-10 rockets onto NVA anti-aircraft sites. Two 37 mm AAA guns and a large warehouse were destroyed during the squadron's first, and only, flight north of the DMZ. Sadly, the Voodoo pilot, Capt Robert Stubberfield, did not survive the shoot-down.

Air cover was provided for the Marine Corps landing on 7 May that initiated the establishment of the new facility at Chu Lai – this would ultimately become the largest Marine base in Southeast Asia. Convoy escort missions also commenced later that month, a pair of F-4Bs orbiting in the vicinity of supply truck convoys in an effort to suppress VC ambush attempts. On 13 May the first nocturnal sorties without flares, but under a full moon, protected 3rd Marine Division patrols and a FAC who had been fired upon near Chu Lai. The ordnance expended by the F-4B crews caused numerous fires and two large secondary explosions. Napalm was also used by VMFA-531 for the first time on 13 May, Capt Mike 'Lancer' Sullivan participating in this strike;

'We dropped twelve Mk 79 Mod 1 1000-lb "napes" – six per aircraft. Eleven were duds, the reason being that the fuses were held into the canisters by wooden pegs, and of course when the canister hit the ground the impact made the fuse separate and ignite in the air, but the napalm itself didn't ignite. So little was known about the F-4s by the ground-based FACs in-country at this early stage in the war that the controller asked us to come back and try to ignite the "nape" with our 20 mm guns, as it was right where he wanted it. We sadly informed him that the F-4B had no guns.'

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VMFA-531 personnel drew on their brief combat experience in South Vietnam when the unit was re-designated as a training unit at MCAS Cherry Point, North Carolina, on 15 June 1965. From then on the 'Gray Ghosts' would prepare F-4 units rotating to Vietnam, the VMFA-531 syllabus emphasising air-to-ground training over the MCAS Yuma, Arizona, ranges. F-4B-12-MC BuNo 150411/EC 13 is seen here with rocket pods and practice bombs over the Yuma ranges in December 1966. The Marine Corps' first dedicated fighter/attack training squadron (VMFAT-201) was formed at Cherry Point in April 1968, using the assets and accumulated experience of the 'Gray Ghosts' (*John Krill*)

This was one of many occasions when the decision to remove guns from the original F4H design resulted in lost target kills, but bullets were not the only thing lacking at this early stage. The US Navy ordnance stores at Subic Bay, in the Philippines, kept the Seventh Fleet carriers stocked with bombs and rockets, but none had been pre-positioned at Da Nang ahead of the 'Gray Ghosts" arrival at the base. US Navy C-118B Liftmaster transport aircraft brought in supplies of 2.75-in rockets, but the Marines had to send a ship to fetch 500-lb bombs from Subic Bay.

Napalm was considered too hazardous for use from aircraft carriers, so the Marine Corps initially had to make its own, mixing contaminated JP-5 fuel with a polystyrene-based thickening agent and feeding it into fragile World War 2-vintage aluminium drop tanks. The failure rate on the first Mk 79 napalm missions was 50 per cent due mainly to the faulty igniters, which were temporarily duct-taped to the canisters. This figure was soon improved by mixing different proportions of jet fuel and thickener. The Mk 79 tanks were also judged 'too aerodynamic for a good spread pattern'.

VMFA-531's final weeks at Da Nang saw increasingly intense combat. A battalion of the ARVN's 51st Regiment was ambushed by VC near Quang Ngai on 30 May, requiring six days of sustained CAS missions to allow some of the allied troops to escape. On 3 June, a night CAS attack with flares, Zunis and Mk 82s caused 168 confirmed VC casualties.

By the time the squadron had returned to MAG-11 at Atsugi on 8 June (the first two aircraft had departed Da Nang five days earlier) it had completed 970 missions, including 275 CAS and escort missions for Marines. Although some squadrons would achieve higher mission totals as the war expanded, none of them pioneered as many mission profiles or achieved such a favourable availability rate (92.5 per cent) during the war without a single aircraft loss as VMFA-531. F-4Bs BuNo 150486 and 150468 were among the unit's most reliable jets. Available aircraft usually flew at least one sortie daily. Typically, about 12 of the 15 available aircraft could be put on the flightline daily, although not all would have 'full systems' radar.

VMFA-531 was replaced at Da Nang by VMFA-513 'Flying Nightmares', the latter unit arriving in-country on 15 June. It would be the only Marine

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F-4 unit at Da Nang until joined by VMFA-542 'Bengals' from 10 July 1965. Along with VMFA-531, VMFA-513 subsequently completed its combat tour without suffering a single loss – these were the only two Marine Corps Phantom II squadrons to achieve this distinction.

Among the 'Flying Nightmares" aircrew was Capt Doyle D Baker, who later served his third combat tour with the 13th TFS at Udorn Royal Thai Air Force Base (RTAFB), rather than the Marines. On 17 December 1967 he became the first of two Marine F-4 pilots to score a MiG kill while on a USAF exchange tour. The second aviator, on an exchange tour with the 58th TFS, was Capt Larry Richard who, along with US Navy exchange pilot Lt Cdr Mike Ettel, destroyed a MiG-21 with an AIM-7E-2 Sparrow on 12 August 1972.

The 'Flying Nightmares', like most other Marines F-4 units, were denied aerial combat opportunities of this kind. Air-to-ground missions would dominate the squadron's four-month tour, which began on 15 June with a series of 'helo escort/LZ prep' and either pre-briefed or 'scramble' (hot-pad alert) *Blue Blazer* or *Flaming Arrow* strikes using three or four F-4Bs with Mk 81 bombs and Zuni rockets. VMFA-513 typically averaged four such missions per day, with targets predominantly being 'structures' in wooded terrain, attacked under the control of Bird Dog FACs. The BDA following such attacks was frequently limited to 'area saturated [with ordnance] but results unknown due to tree canopy'. Sometimes secondary explosions or fires indicated real damage had been inflicted, particularly when the heavier Mk 83 bombs were carried.

30 June was a particularly busy day, with six missions totalling 22 sorties being launched – two for CAS 'helo support/LZ prep', three against VC troops and bivouac areas and a mission by four F-4Bs against a suspected mortar position in nearby woods. The results for all of these missions were classified as unknown. Defences at Da Nang and Chu Lai were beefed up and foxholes or shelters provided for all personnel, but the rockets and mortars continued to fall regularly.

The squadron's biggest task, and the first big Marine Corps operation of the war, began on 18 August when Operation *Starlight*, or the Battle of Chu Lai, was initiated. The bases at Da Nang and Chu Lai had both been established in areas of intense VC activity, and both came under frequent attack from enemy sappers and rockets. By August 1965 the communists had decided to make a concerted attempt to overrun the new base at Chu Lai, prompting the VC's 1st Regiment to assemble more than 2000 troops just 15 miles from the airfield. A pre-emptive attack was launched using two Marine battalions in both amphibious and helicopter-borne assaults, supported from the air by VMFA-513 and the A-4 Skyhawks of VMA-311 'Tomcats'.

The cost to the enemy of this six-day onslaught was reckoned at 964 dead, and in the words of Brig Gen Edwin Simmons, 'the Viet Cong were disabused of any illusion that they could defeat the Marines in a stand-up battle'. However, the two bases remained under constant threat and frequent attack for the rest of the war, and many more 'search and destroy' operations with substantial air support were required to preserve them.

Resorting to guerrilla tactics and using the extensive network of tunnels and waterways in the area, the VC made their first raids on the bases on 27 October. Demolition teams cut through the defences, supported by mortar fire, and destroyed 24 helicopters at Da Nang and two A-4s at Chu Lai. Another 29 aircraft were seriously damaged. Three Americans and most of the VC sappers were killed in the raid.

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CAS, McCUTCHEON AND CONTROL

Using its own air power to support its troops on the ground was integral to the Marine Corps' doctrine immediately post-World War 1, when dive-bombing missions were part of operations in Haiti and the Dominican Republic. During World War 2 CAS was inhibited by the US Army's distrust of its accuracy. In the Pacific war theatre the jungle-covered terrain and difficult radio communications meant that air power was more often employed for Direct Air Support (DAS) against pre-planned targets without guidance from controllers on the ground. However, in 1942, the Marines experimented with radio-equipped Air Liaison Parties, Close (ALPs) using coloured smoke and fabric panels to mark targets.

CAS subsequently became feasible during February 1945 on the Philippine island of Luzon, when patrolling Marine Corps SBD Dauntless dive-bombers were called in by ground commanders via radio-equipped Jeeps against Japanese forces. Their accuracy routed the enemy forces and convinced senior commanders of the value of CAS tactics.

Flying with the pilots over Luzon as operations officer for MAG-24 was Lt Col Keith B McCutcheon, who was already a powerful proponent of CAS as an extension of the 1939 definition of Marine air power as 'support for Marine amphibious landings and troop activities in the field'. In 1944 he had formalised the training of ALPs, which had enabled the Luzon SBD pilots to perform so effectively. CAS, increasingly managed by FAC(A)s, developed further during the Korean War, and was particularly effective during the Chosin Reservoir campaign when F4U Corsairs did much to blunt massive Chinese and North Korean attacks. Corsair and Tigercat pilots flew many day and night missions against Communist transport and troops, usually directed by USAF FACs. Later in the conflict, VMF-311 became the first Marine Corps jet squadron to see action, flying CAS in F9F-2 Panthers controlled by T-6 'Mosquito' FACs.

The Korean War also brought helicopters to the forefront of Marine Corps airborne activity, and this continued with UH-34Ds at the very start of the US involvement in Vietnam during Operation *Shufly* in 1962-65. Proving terribly vulnerable to ground fire, rotary-winged units relied on VNAF T-28 Trojans and A-1 Skyraiders for escort and CAS. From 1965 the UH-34Ds were joined by other MAGs, each one dedicated to a particular task, and managing the resources, administration and logistics required for this.

Normally a MAG operated just one type of aircraft. In 1965-66, MAG-12 controlled A-4 Skyhawks and MAG-13 F-4 Phantom IIs at Chu Lai; MAG-11 oversaw F-4 Phantom IIs and Headquarters & Maintenance Squadron (H&MS) 11's various support aircraft at Da Nang; and MAG-16,

Maj Gen Keith B McCutcheon was the architect of the CAS concept that generated the majority of Marine Corps F-4 Phantom II missions in Vietnam (*USMC*)

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also at Da Nang, had RF-4B Phantom IIs, RF-8A Crusaders and EF-10B Skyknights until they were reassigned to MAG-11 from 14 July 1965.

Within MAGs, squadrons tended to operate quite independently, as Gen Nyland recalled;

'Individual squadrons had their own flight schedules, and even if you were going to the same target as another squadron, you briefed independently. There was no attempt at an integrated, group-wide schedule.'

Each MAG was supposed to carry enough supplies to fight for 90 days in support of a Marine brigade. Several MAGs together (in the case of MAW-1, MAGs -11, -12, -13 and -16) comprised a Marine Air Wing (MAW). The latter was a Marine aviation unit capable of supporting an entire division by providing air superiority over an amphibious landing area, cutting enemy supply lines and interdicting reinforcements, while also providing air defence, support of ground troops and appropriate reconnaissance. From June 1965 to June 1967 MAW-1, with headquarters at Da Nang, supported the 3rd Marine Amphibious Force (MAF). Commanding the wing was Brig Gen Keith B McCutcheon.

Like his superior, Maj Gen Lewis W Walt, who led all Marine Corps forces in Vietnam, McCutcheon was determined to maintain the Marines' traditional self-sufficiency and independence as a fighting force. To him, 'Marine Air' existed to support Marines on the ground. He had seen this integrity divided and subordinated to the dominant US Army and USAF during the Korean War, and both men were also very aware that Gen William Westmoreland, head of Military Assistance Command, Vietnam (MACV), and Gen Joseph Moore (commanding the USAF's Seventh Air Force and deputy MACV commander for air operations) wanted Marine air assets to be absorbed into an overall aerial strategy.

Between February and July 1965, discussions were held between Brig Gen McCutcheon, Maj Gen Walt and Lt Gen Moore on the employment of 'Marine Air' in Vietnam. Marine Corps Phantom IIs featured prominently in these talks, thanks to their air defence and (to the USAF) secondary attack capabilities. As a compromise to guarantee the availability of F-4Bs for CAS, it was conceded in August that the USAF could call upon Marine Corps Phantom IIs to perform air defence duties when required, while 3rd MAF retained control of Marine air assets for other purposes.

In March 1968 this arrangement was replaced by the 'single-management' concept, whereby Gen Westmoreland via Gen Moore's successor, Gen William Momyer, and McCutcheon's replacement, Maj Gen Norman Anderson, could handle the increasingly complex wartime air operations between them. This temporary respite from outside interference for 'Marine Air' lasted only a matter of weeks, however, for Westmoreland quickly persuaded President Lyndon Johnson to let him put all operations by 1st MAW fixed-wing assets (by then more than half of all the aircraft owned by the Marine Corps) and its sophisticated radio-control networks under Momyer's direct control.

However, in practice the Marines retained day-to-day control of around 70 per cent of their sorties, as most were 'fragged' (allocated) back to them by the USAF and could be used for hot-pad CAS/DAS missions at their discretion. The Da Nang-based Tactical Air Direction Centre (TADC) also continued as the main communications net for I Corps, nominally shared with the USAF and US Navy.

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Da Nang was situated in the centre of the Marines' main area of responsibility, namely I Corps Tactical Zone, the most northerly of the four corps areas into which South Vietnam was divided. This coastal strip of the central lowlands, where most of the Marines' combat took place, extended roughly 200 miles from the DMZ in the north to Sa Huynh on the border of II Corps' operating area. Its local defence included 30,000 ARVN troops and about 35,000 regional and provincial force South Vietnamese. 1st MAW flew in support of these forces in conjunction with Marine Corps activities.

Brig Gen McCutcheon's staff produced a Wing Operation Order for the whole MAW specifying details of all air activity in advance, and shorter-notice fragmentary operational orders ('frags'), which detailed the day's strikes for unit squadron, taking into account aircraft availability, ordnance types, routes to targets and timing, etc. Squadrons usually received their 'frag' a day prior to it having to be carried out.

Many missions, often the majority, were quick-reaction hot-pad alert sorties, launched in immediate response to emergency calls from ground commanders. McCutcheon also had single F-4Bs on station over advancing Marine battalions, or waiting on the runway for a takeoff call from Da Nang's TADC through the Marines' advanced radio command net that he had developed since 1944. His TADC worked in conjunction with two Tactical Air Operations Centres, one at Monkey (actually Mon Ky) Mountain, near Da Nang (upgraded to a Marine Tactical Data System by 1969), and a second at Chu Lai, 55 miles south of Da Nang. They managed the airspace in I Corps, linked to the US Navy Tactical Data System, tracking all aircraft movements and, if necessary, scrambling Marine Phantom IIs to deal with potential airborne threats.

At the sharp end of the command network in 1965 were the two Direct Air Support Centers (DASCs) at Phu Bai and Dong Ha, where the MASS manned the Tactical Air Request Net. They were the first to receive calls from FACs on the ground or in 'spotter' aeroplanes requesting air support, often via a radio-relay KC-130. These requests were transmitted to a DASC, which launched the Da Nang hot-pad or 'on station' Phantom IIs in the direction of the threat. Nearer the target, control was returned to the FAC, who guided F-4 and A-4 pilots for the most effective ordnance delivery.

Like the USAF, the Marines initially used the Cessna O-1 Bird Dog as a FAC aircraft, these machines being assigned to VMO-6 in I Corps. They sufficed until purpose-built North American OV-10A Broncos became available in 1968. Marine observers also flew with the US Army's 220th Reconnaissance Company, and F-4B units had to allocate several crew members for FAC duty after they had spent six months in-theatre. The USAF also quickly established FAC(A) units to support strike aircraft operating over Laos and South Vietnam, and they duly directed many Marine Corps missions.

In 'Deej' Kiely's opinion, as the conflict widened, 'the "Covey" FACs of the USAF's 20th Tactical Air Support Squadron were the best, flying Cessna O-2s and, later in 1972, OV-10As. Then there were the "Nail" FACs operating way north in Laos – a gutsy mission for a slow mover. As for "Fast FACs", the guys in F-4 Phantom IIs from the 8th TFW at RTAFB Ubon were top drawer'. The Marines pioneered the use of 'Fast

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FAC' jets from 1966, using armed H&MS-13 Grumman TF-9J Cougars to protect helicopter landing zones while the back-seat crew member provided effective target guidance for strike aircraft. They were replaced in 1967 by new TA-4F Skyhawks, which also served as escorts, naval gun-fire spotters and tactical air coordination aircraft.

HOT HARDWARE

As many FACs had fast jet experience, they understood the characteristics of the aircraft they were guiding and the capabilities of the weapons they carried. F-4 crews announced the composition of their ordnance en route to the target so that a FAC could decide whether their weapons fitted the task, and advise them of the best ways to use them, as well as providing approach routes and altitudes, possible hostile resistance and egress directions. He also specified a 'safe drop zone' for unused ordnance, although Phantom IIs usually took it home in 1965-66, and a suitable bail-out area if the worst should happen. FACs related BDA to pilots, although it was often incomplete as it was usually transmitted on unsecured radios.

In May 1965 it was noted that red smoke from marker rockets could be hard to spot, so white smoke was substituted. F-4B pilots also reported that the small FAC aircraft were almost invisible against forest terrain, so a white stripe was painted on their upper wing surface.

Gen 'Spider' Nyland, who saw combat in Vietnam as a RIO with both VMFA-314 and VMFA-115, described a typical hot-pad launch;

'The pilot would get the jet started while the RIO would get the brief. For a pre-briefed ("frag") mission we both took the brief, and usually the pilot pre-flighted the airplane while the RIO pre-flighted the ordnance. Once we got going, the RIO handled the radio, navigation and checking in with the FAC. We both took down the brief from the FAC, after which the RIO would read back the run-in heading, elevation and position of "friendlies" to the pilot to make sure that we had got it exactly right.

'Manoeuvring near the target, both crewmen would be looking for the FAC's mark. Once we got that the RIO would have calculated the drop altitude, airspeed and "mil" setting [on the gunsight]. He would have also given the pilot a running commentary as we went "down the 'chute" on the altimeter and airspeed, calling "standby" and "mark" [at drop altitude], with a "pull-up" call if he didn't feel "g" coming on the airplane. RIOs were always looking outside, while the pilot had to be focused on the target, particularly with the weapons system we had in the F-4B. A lot of guys used to say we'd have been just as well off with a grease pencil mark on the windscreen.'

All weapons aiming was done with a very basic 'iron cross' visual bombsight, as Maj Gen Sullivan explained;

'The bombsight was just a drum you turned to get the aiming "pipper" to the proper "mil" setting. The "pipper" was an aiming dot projected onto the gunsight glass, and its position would be set in "mils" according to the ordnance carried and the chosen dive angle, so that the aircraft would be at the correct attitude when the weapons were punched off their racks.'

FACs knew that Mk 81 bombs ('Delta Ones' or 'D-1s' in radio traffic language) had a lethal radius of about 270 metres. Mk 81s or 500-lb Mk 82s ('Delta 2') could be fitted with three-foot 'daisy cutter' extenders

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to explode above ground, although timing had to be very accurate when using these weapons so as to avoid the bomb impacting before the fuse timer ran out. Fitted with a less reliable electrical fuse in the bomb's conical tail, 'daisy-cutters' could also be used against harder targets such as buildings and armour.

Against the extensive networks of underground tunnels and bunkers in I Corps, FACs and mission planners preferred the penetrating power of 1000-lb Mk 83 low-drag bombs. These were the largest weapons normally carried by Marine Corps Phantom IIs, although 2000-lb Mk 84s were regularly expended by USAF F-4 and Marine Corps F-8 Crusader units, sometimes with 'daisy cutter' fuses for flak suppression and LZ prep. M117 750-lb blast bombs ('Delta 26s') were useful against lighter structures.

US Navy-developed Snakeye bomb-retarding kits were available for the Mk series of bombs. The Mk 14 tail unit could be attached to Mk 81 bombs, while the Mk 82 had the similar Mk 15 kit, making both 'Mod 1' bombs – they were colloquially known as 'Snakes'. Four 'spades' (large 'petal' airbrakes) extended from the rear of the bomb when a retaining ring and wire were unleashed, in conjunction with arming the bomb's tail fuse, immediately after it was dropped. This rapidly slowed the bomb's trajectory, allowing it to be released from as low as 150 ft, with minimal risk of shrapnel damage to the F-4. A retarding kit for the M117 (M117R) was also briefly used from December 1967.

Until the Seventh Air Force imposed a minimum 3000 ft altitude for all ordnance delivery, Snakeye bombs were dropped at high speed below 200 ft for the greatest possible accuracy. Although the maximum speed limit for delivering Snakeyes (and napalm) was officially 450 knots, this was often exceeded, as Col Manfred Rietsch remembered;

'I dropped them at 550 knots with good success in CAS missions that had been opposed by lots of AAA. Mk 80 series bombs fell very fast – a few times transonically. Many of the ordnance limitations were based on a peacetime test environment. In Laos or up North, where people were shooting at you, you wanted to be steep, fast and unpredictable. You improvised on textbook solutions.'

FACs were also fully aware that aircraft launching Zuni rockets had to pull out of a dive at altitudes above 1500 ft so as to avoid self-inflicted damage from fragments. The eight-foot-long unguided Zuni offered greater accuracy than 2.75-in free-flight rockets. Although smoke or flare warheads could be fitted, the more usual Mk 63 high explosive

'Black Knights" F-4B-15-MC BuNo 151459 returns from an early 1966 sortie with empty TERs and centreline MER. Typically, a division of four F-4Bs in mid-1965 carried 12,500 lbs of internal fuel and up to 5000 lbs in external tanks. Two aircraft from the division carried four Mk 82 bombs each and the other pair had six Mk 81s apiece. Another typical four-ship would carry six Mk 81s on three aircraft and four 19-shot pods of 2.75-in rockets on the fourth. Each aircraft would make up to six ordnance passes on the target. The all-rocket load, when carried, could comprise 16 Zuni or 76 2.75-in rockets, with four or five passes per aircraft, depending on ground fire, which was usually light at that point in the war. The squadron usually divided its 'hot pad' alert flights into two sections – 'A' with Mk 82 bombs and Zunis and 'B' with Mk 81/82 bombs and Mk 77 napalm (*USMC*)

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With empty bomb racks, VMFA-115's F-4B-23-MC BuNo 152299 heads back to Da Nang. After being transferred to training squadron VMFAT-101, this Phantom II crashed during a ground-attack training sortie at MCAS Yuma on 6 October 1969. Both crewmen perished (*USMC*)

fragmentation warhead could destroy a building. Its red-hot shrapnel was also a fearsome anti-personnel weapon. Four Zunis could be loaded in a LAU-10 treated-paper, aluminium-skinned launcher, and F-4Bs could carry up to ten pods – four, plus bombs or napalm was a more usual load, however. On launch, the 56-lb Zuni's retractable fins extended, guiding it in flight at speeds up to Mach 1.4. A twin-tube LAU-33A/A launcher was also available, often fitted to the inboard LAU-17 wing pylon.

The weapon was used against AAA by several squadrons including VMFA-314, for whom it was a standard fit for air-to-ground missions. 'It was a great weapon to get the gunners' attention in North Vietnam or Laos', Maj Gen 'Lancer' Sullivan explained. 'We'd have our 110-135 mils cranked into the gunsight for the bombing setting, but prior to takeoff we'd enter in 35 mils on the sight [the boresight setting for the F-4 and for the AIM-9 Sidewinder] and then put a grease-pencil mark where the 35 mil setting was. Then we'd return the mil setting drum to the proper bombsight setting we were going to use.

'At the top of your bomb-run – as long as you could get the grease-pencil marking where you thought the AAA was – you'd fire the Zunis via the trigger, and still have your "pickle" switch for dropping bombs later in the run. I don't know of a single Marine F-4 loss on a pass in high AAA territory when Zunis were used to commence the bomb run. You can imagine that for a good AAA gunner a couple of 5-in rockets going at about Mach 3 when they hit the ground would certainly grab his attention, thus causing him to get behind with his tracking. They sounded like a freight train coming at you'.

High explosive 2.75-in Folding Fin Aerial Rockets achieved their optimum fragmentation pattern about six seconds after firing, and they were best used for coverage of a wide area. The 11.4-lb rockets were usually loaded into 19-tube LAU-3 treated paper pods. High explosive, fragmentation and white phosphorus warheads for target marking could be attached to the rocket bodies, and each loaded pod weighed around 500 lbs. They were usually fired in a salvo, and some could collide or be sent off course by turbulence caused by the other rockets, resulting in 'stray' missiles that were dangerous when undertaking CAS. Ripple firing was possible, but this had to be initiated further from the target, lobbing rockets at an

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angle to allow for the extra distance and then lowering the Phantom II's nose towards the target. At this point turbulent air from the missiles could be ingested into the aircraft's intakes, disturbing the airflow to the engines.

Mk 77 500-lb napalm ('Delta 9') canisters were usually dropped in a ten- to thirty-degree dive at up to 450 knots from altitudes as low as 100 ft, thus avoiding the risk of aircraft damage from the resulting fireball. The poor aerodynamics of the Mk 77 canister made accurate delivery difficult, so FACs had to allow a larger safety margin from friendly forces when using napalm than with other ordnance. Canisters dropped simultaneously from an F-4 could land some distance apart, but lower drop altitudes reduced the margin of error, while making the pilot's pull-out and recovery more vulnerable to ground fire and to 'target fixation' – the latter could induce a micro-second's miscalculation, resulting in impact with the ground.

Sometimes, the terrain and disposition of ground forces meant that a FAC had to order a napalm run from behind 'friendly' troops, but commanders of patrols that were about to be overrun by VC seldom objected to this additional hazard.

Steeper dive angles increased bombing accuracy, as previous 'Marine Air' wartime experience had shown. However, hauling a heavy near-supersonic F-4 out of a dive with a 4-5g pull-out was a strenuous exercise that required more altitude than a 20-30 degree dive permitted, thereby reducing the accuracy conferred by the steeper dive. A RIO's job included calling out altitudes in a dive attack, and reminding the pilot of the minimum permissible pull-out height based on speed, angle and aircraft weight. Even so, many jets were lost to errors in calculation or target fixation if pilots took a fraction too long in trying to ensure a hit on their aim point. FACs helped by providing information on the heights of trees (often more than 100 ft) and terrain in the target area.

Forest cover was clearly a real obstacle to any ordnance delivery, and to napalm in particular. F-4 pilot John Nash recalled, 'We delivered napalm and CBUs, but the big problem was that when you were at really low altitude in level delivery you couldn't see your target unless it was under the nose because of the jungle cover. Delivery of napalm in this way was almost impossible down South because the hootches and other targets were usually in small clearings, and you couldn't see those. We went to a minimum ten degrees dive delivery for CBU and napalm. I used a 30-degree dive with a 3000 ft release point. Everyone had their own techniques'.

Once weapons were dropped the RIO would look for BDA, as Gen Nyland explained. 'There was some visibility from the back seat, but the airplane had to be rolled, and then you could see an awful lot. It wasn't uncommon to be able to look back and say "that hit was right on the mark", shortly followed by the FAC's comment to that effect'.

The chances of aerial combat were slight on the F-4 squadrons' in-country missions, although a token missile load was often carried. In general, as Col Kiely observed, 'Restrictive rules of engagement reduced the air combat potential of the F-4 by limiting AIM-7 Sparrow use to visual identification range. Carrying four AIM-7s and four AIM-9s [the standard configuration for air-to-air], along with bombs and external tanks, weighed the F-4 down with a large drag index. For that reason Marine F-4s often carried no air-to-air weapons or, at most, two AIM-9 Sidewinders'. For much of the war, as Brig Gen McCutcheon conceded,

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'Vietnam, at least as far as the war in the South was concerned, was not a fighter pilot's war. There were no air-to-air engagements for Marine squadrons, and no aces'.

NEW FACES, NEW PLACE

The steady build-up of US forces in South Vietnam during the summer of 1965 began to cause severe overcrowding at Da Nang, where limited facilities at the world's busiest single-runway airport were shared by USAF, VNAF and Marine Corps units, including five fighter/attack squadrons of the USAF's 35th TFW. MAG-11 comprised the 'Gray Ghosts" replacement, VMFA-513, from June until October 1965, as well as VMFA-542 for the first of its two deployments to Da Nang from July 1965. In October 1965 VMFA-115 made the first of six deployments to bases in the area, and VMFA-323 arrived in December, followed by VMFA-314 in January 1966.

Marine Corps expansion beyond two F-4 units in theatre – even with the addition of a second parallel runway at Da Nang – was clearly unfeasible, as monthly aircraft movements at the base approached 50,000. The Marines needed another base with adequate space and greater autonomy so that they could expand their A-4 and F-4 operations. However, there were only two other jet-capable airfields in South Vietnam – the equally overcrowded Tan Son Nhut Airport in Saigon and the USAF's busy fighter base at Bien Hoa. The Vietnamese were reluctant to cede their ancestral territory for military use, so a site was found on defensible sandy coastal land about 55 miles south of Da Nang.

World War 2 ace Brig Gen Marion E Carl led an unopposed landing by the 3rd Marine Expeditionary Brigade on 7 May 1965 and Naval Mobile Construction Battalion 10 began the construction of a 'short airfield for tactical support' (SATS) based on a 1200 ft runway surfaced with 12 ft, 160-lb, AM-2 interlocking metal planks, with an M-21 MOREST aircraft-carrier type, dry-friction rotary-brake arresting gear and launching catapult. It was the first combat use of a concept evolved at the Marine Corps Development Centre at Quantico, Virginia, over the previous ten years as a means of rapidly inserting land-based Marine Corps air power into an area with no existing airfields.

Merely off-loading the construction vehicles from ships on to the deep, sandy terrain was a serious problem. Some stability had to be provided for the AM-2 'tinfoil strip' areas, so local laterite soil was laid over the sand in vast quantities after a road had been built to transport it to the site. The M-21 MOREST arresting gear stopped an aircraft within 250 ft, but the A-4s of MAG-12 – the airfield's first occupants – had to use Jet-Assisted Take-Off (JATO) rocket packs at first, pending the arrival of the turbine catapult in April 1966. Col R W Baker, commanding MAG-12, made the first landing in an A-4E Skyhawk on 1 June 1965, and VMA-225 jets flew the first combat mission a month after construction began.

F-4B-15-MC BuNo 151020 was one of 29 F4H-1s loaned to the USAF in early 1962 as F-110As to initiate service usage of the F-4C. Returned to Marine Corps ownership, with its identity underlined by the inscription *Marines* in small letters above the Bureau number forward of the stabilator, the Phantom II is seen here at Da Nang serving with VMFA-323 in October 1966. The jet's final squadron assignment was with VMFA-115 at Chu Lai, where it was lost when a fire broke out in the left cockpit console on takeoff on 30 September 1967 (*Dick Hill Collection/Tailhook Association*)

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By then the Seabee troops had installed a fuelling system using six 10,000-gallon fuel bladders, a carrier-type mirror landing aid and basic buildings. As the airfield site lacked a local Vietnamese place-name, its prime mover, Lt Gen Krulak chose 'Chu Lai', which was allegedly a Chinese rendering of his own name.

The first F-4 'cat shot' from Chu Lai on 3 August 1966 revealed some confusion on the part of the launch crew concerning Phantom II catapult procedures. Col Robert Johnson had led in a six-aircraft detachment from VMFA-323 at Da Nang to provide both advance combat support ahead of the September 1966 MAG-13 deployment to Chu Lai and to gain operational experience of the field catapult.

The first mission was a four-aircraft CAS, each F-4B carrying 12 500-lb bombs and full fuel for a takeoff weight of 54,800 lbs. Col Johnson carefully briefed the crews on catapult procedures, possible emergencies and corrective action. He and RIO 1Lt Jim Lesieur were first to launch. As he recalled, 'The catapult shuttle looked like a very large door with a large "ear"-looking device on either side of the forward edge. The aircraft attached to this device with a long cable, which wrapped around the nose of the shuttle and back to built-in catapult hooks on the aircraft. For the A-4 the cable went under the "ears", and for the F-4 they did not.

'Because all of this was going on under the aircraft, the flight crew couldn't observe the process. After what seemed to be a long period of time, with Marines running back and forth underneath our aircraft, they finally gave us a "thumbs up" and signalled to extend the nose-gear strut – a procedure used on ship and land catapults to ensure proper angle of attack on launch. Full power applied with afterburners, I saluted for launch.

'About halfway down the track the aircraft seemed to lurch up to a higher, nose-high attitude, and simultaneously with hitting the end of the catapult track, the starboard engine suffered catastrophic failure (it exploded). My attention at this time was directed to my immediate front, which consisted of numerous trucks, Marines and civilians waiting at a checkpoint off the end of the runway. Slowly climbing, I next noticed the base ammunition dump below my flight path. My briefing on emergency jettisoning of external stores did not cover this eventuality, but we were still flying . . . albeit only briefly.

'I made a slight turn to the right in the direction of what appeared to be a clear area where we could jettison. As I tried to level the wings the stick bucked and froze in my hand. All I had to say was, 'Eject, Jim, Eject'. Jim responded instantly, and after hearing the second explosion, canopy and seat, I followed suit. Our altitude at the time was 100 ft or less. When my seat fired the aircraft was nearly 90 degrees to the horizon. As advertised, seat separation and 'chute opening occurred automatically, and I got a 90-degree swing in the 'chute before landing in a three-wire concertina fence. I looked up in time to see Jim come down in his 'chute about 30 yards away. The aircraft [BuNo 152330] disintegrated about 50 yards beyond that, but none of the bombs detonated'.

Acutely conscious that he had missed being impaled on an eight-foot iron fence post by only a few inches, Col Johnson was taken with his RIO to the base hospital, being greeted en route by Lt Gen Lou Walt, commanding general of 1 MAF, while the rest of his flight 'got on with the mission. They did not return to the flightline but rather pressed on to "bring the fight to the foe", achieving once again incredible BDA to impress even the most sceptical of Pentagon observers.

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'In the aftermath, it seems that the catapult crew had managed to get the cable under the "ears" (wrong) on the shuttle, which caused the abnormal rising of the shuttle on the launch and the subsequent ingestion of the ears by the aircraft engines when they tore from the shuttle. The F-4 was subsequently modified so that the redundant hydraulic systems were not co-located in a single-point failure. Ejection seats were also modified for sequential ejection from either the front or rear seat'. Col Johnson was awarded the DFC following this incident.

Chu Lai's sandy foundations proved to be an immense problem, and the clay-like laterite had to be re-laid several times when the runway became undulating. Rainfall soon turned the soil mixture into the deep, cloying mud that became most occupants' lasting memory of Chu Lai in 1966. However, the runway (03) was soon extended to 8000 ft, reducing the need for a catapult, and it was still in use in 1970, although a 10,000 ft concrete runway was added in 1966 with ramp space for MAG-12's Skyhawks and the Phantom IIs of MAG-13.

Two squadrons, VMFA-314 and VMFA-323, moved from MAG-11 at Da Nang in September-October 1966, and they were joined on 10 October by VMFA-542, which had been with MAG-15 at MCAS Iwakuni since mid-August. Maintenance facilities at first comprised a single half-clamshell tent, although most work was carried out in the open air, even in monsoon weather. Three hangars were eventually built in 1967. The SATS equipment at Chu Lai had its first sustained use by the F-4B units in September 1967 when the base's main runway was closed for 18 days for repairs and the installation of runway lighting. This was needed partly because of the increasing demand for night and bad weather sorties during Operation *Kingfisher* – the concerted effort to destroy NVA artillery and rocket positions just north of the DMZ to stop them from bombarding Marines in the Con Thien quadrangle area.

Minimum altitude restrictions imposed by Seventh Air Force made the detection of these artillery sites very difficult, although it reduced casualties from AAA. Sometimes crews struck lucky. A night flight led by Capt Quilter saw an NVA rocket site fire a barrage of missiles from directly below their flightpath on 22 September. Despite the lack of flares, the two F-4B crews identified the site in the dark and immediately bombed it, causing spectacular secondary explosions.

Periodic shortages of qualified RIOs sometimes led to crew scheduling strains. John Trotti, who was serving with VMFA-314 in 1966, recalled that he 'actually flew some *Steel Tigers* (the ubiquitous "Manual 45 to Tchepone", in Laos) in the March-April 1966 period with no one in the back seat! A typical baptism for replacement RIOs, who were often arriving in Vietnam with fewer than 20 hours in the aircraft in 1966, was to throw them in the back seat for a *Steel Tiger* after one daytime area-familiarisation hop. I could see why RIOs didn't like the night missions'.

This VMFA-314 jet took ground fire panel damage to several areas of its lower fuselage but the hardy J79 engines kept turning and brought the crew home (*National Naval Aviation Museum*)

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1
F-4B-13-MC BuNo 150470/WF 7 of VMF(AW)-513, MCAS El Toro, California, April 1963

2
F-4B-18-MC BuNo 151456/EC 7 of VMFA-531, Da Nang, South Vietnam, April 1965

3
F-4B-23-MC BuNo 152274/VW 5 of VMFA-314, Da Nang, South Vietnam, March 1966

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4
F-4B-22-MC BuNo 152259/VE 7 of VMFA-115, Da Nang, South Vietnam, April 1966

5
F-4B-16-MC BuNo 151417/WH 9 of VMFA-542, Da Nang, South Vietnam, May 1966

6
F-4B-21-MC BuNo 152238/WH 1 of VMFA-542, Da Nang, South Vietnam, July 1966

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7
F-4B-10-MC BuNo 149440/VW 9 of VMFA-314, Chu Lai, South Vietnam, November 1966

8
F-4B-9-MC BuNo 149420/VW 5 of VMFA-314, Chu Lai, South Vietnam, November 1966

9
F-4B-22-MC BuNo 152258/WS 11 of VMFA-323, Chu Lai, South Vietnam, December 1966

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10
F-4B-22-MC BuNo 152260/WH 1 of VMFA-542, Chu Lai, South Vietnam, June 1967

11
F-4B-11-MC BuNo 149452/WS 17 of VMFA-323, Chu Lai, South Vietnam, February 1968

12
F-4B-16-MC BuNo 151407/DC 1 of VMFA-122, Da Nang, South Vietnam, January 1968

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13
F-4B-15-MC BuNo 151013/WS-11 of VMFA-323, Chu Lai, South Vietnam, February 1968

14
F-4B-21-MC BuNo 152243/VW 13 of VMFA-314, Chu Lai, South Vietnam, September 1968

15
F-4J-34-MC BuNo 155738/WU 9 of VMFA-334, Da Nang, South Vietnam, 27 October 1968

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16
F-4J-34-MC BuNo 155735/WU 6 of VMFA-334, Da Nang, South Vietnam, November 1968

17
F-4B-14-MC BuNo 150484/VE 10 of VMFA-115, Chu Lai, South Vietnam, December 1968

18
F-4J-30-MC BuNo 155819/WT 3 of VMFA-232, Chu Lai, South Vietnam, April 1969

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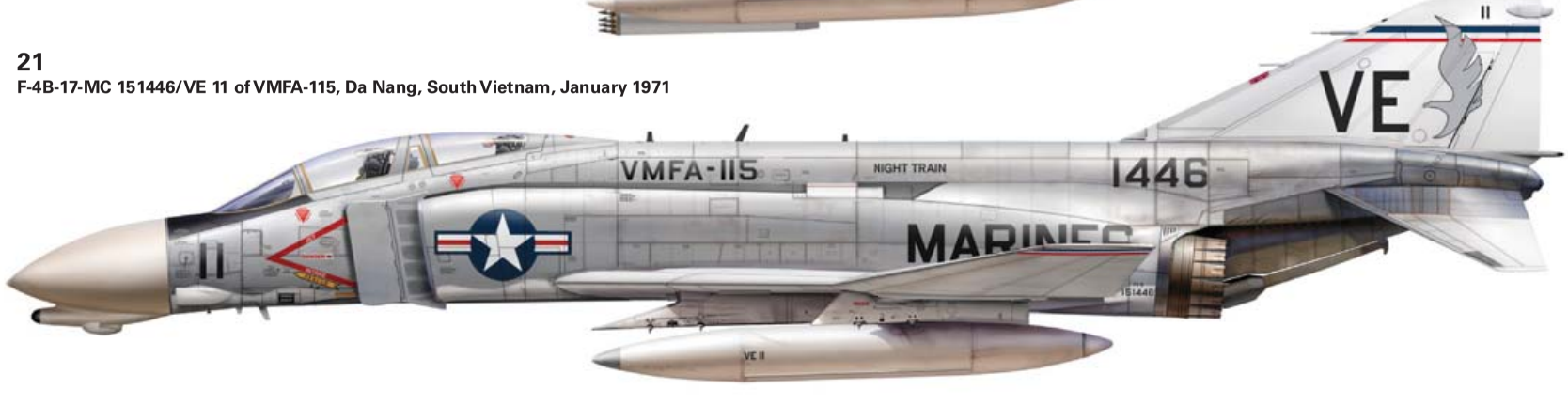
19
F-4J-30-MC BuNo 153822/WT 13 of VMFA-232, Chu Lai, South Vietnam, April 1969

20
F-4B-15-MC BuNo 151454/DC 5 of VMFA-122, Chu Lai, South Vietnam, October 1969

21
F-4B-17-MC 151446/VE 11 of VMFA-115, Da Nang, South Vietnam, January 1971



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22
F-4B-18-MC BuNo 151465/DC 1 of VMFA-122, Iwakuni, July 1972

23
F-4J-31-MC BuNo 153847/WD 7 of VMFA-212, Da Nang, South Vietnam, May 1972

24
F-4J-32-MC BuNo 153877/AJ 207 of VMFA-333, USS *America* (CVA-66), August 1972

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25
F-4J-35-MC BuNo 155806/WT 16 of VMFA-232, Nam Phong, Thailand, September 1972

26
F-4J-33-MC BuNo 155526/AJ 201 of VMFA-333, USS *America* (CVA-66), September 1972

27
RF-4B-26-MC BuNo 153101/RM 15 of VMCJ-1, Da Nang, South Vietnam, December 1966

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28
RF-4B-27-MC BuNo 153109/RM 33 of VMCJ-1, Da Nang, South Vietnam, February 1967

29
RF-4B-27-MC BuNo 153110/RM 24 of VMCJ-1, Da Nang, South Vietnam, March 1968

30
RF-4B-27-MC BuNo 153109/RM 614 of VMCJ-1, USS *Midway* (CVA-41), August 1975

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Lt Col Aubrey Talbert's VMFA-323 'Death Rattlers' sent a six-aircraft detachment, led by Maj B Fritsch, to Chu Lai on 1 August 1966 in response to increased enemy activity in Military Region I. The unit's previous deployment to Da Nang from 1 December 1965 had been eventful, with 407 sorties being flown during the month in support of Operation *Harvest Moon*, 2nd Air Division's *Steel Tiger* campaign and as escorts for VMCJ-1's 'Firecracker' EF-10B electronic warfare aircraft. Performing the latter mission took F-4B crews into more dangerous airspace over North Vietnam, and resulted in VMFA-513's first loss on 7 December.

Squadron executive officer Maj J H Dunn and CWO John Frederick, in BuNo 152261, were flying a night 'Firecracker' escort 45 miles west of Than Hoa when their Phantom II was shot down. It was probably the only loss of a Marine F-4 to an SA-2 'Guideline' surface-to-air missile. There was also some speculation that a MiG may have been responsible, but they seldom flew at night and no claim was made by the VPAF. Maj Dunn evaded capture for a week, but then spent more than seven years in seven different PoW camps until his release on 12 February 1973. CWO Frederick was repeatedly tortured whilst incarcerated, and he eventually succumbed to typhoid in July 1972.

In Lt Col Naviaux's opinion, 'The reason that we didn't lose more aircraft to SAMs was probably due to their absence south of the DMZ. We did have jamming support from the EF-10Bs, which may also have had some effect. We received our "Shoehorn" [radar homing and warning (RHAW) equipment installation] in 1967, and flew with it on every mission. The APR-27 [SAM launch warning] was of no real use since the system's cockpit-mounted red warning light illuminated all the time! We didn't have an instruction book or test equipment for it either'.

Gen Nyland recalled 'we would check "Shoehorn" and leave it on, but it wasn't very reliable in the early days, although it improved later in the F-4's career. I was on a MiGCAP one day and we had a SAM explode between the two aircraft in combat spread formation. We had had zero warning. The SAM may have been launched ballistically, but I didn't have a lot of confidence in the RHAW gear'. 'Shoehorn' was not installed in most US-based F-4s at the time, and 'Spider' Nyland was not alone in seeing it for the first time when he arrived at Chu Lai – a senior RIO showed him how it worked.

Unusual 'Spook' (under the upturned wingtip) and vulture graffiti (on the intake splitter) decorates 'Death Rattlers" F-4B-15-MC BuNo 151455. Although AIM-7 and AIM-9 missiles were usually uploaded, they were seldom required, as VMFA-122 pilot Jacques Naviaux recalled. 'We spent an enormous number of hours maintaining the Sparrow system, and we carried Sparrows and Sidewinders on all missions. The latter was essentially useless due tovisual identification requirements and low reliability. A missile with a one-in-seven chance of launching is not worth the trouble (*Dick Hill Collection via Tailhook Association*)

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A combat-stained 'Black Knights" F-4B-20-MC is towed to its revetment post-mission (*Mule Holmberg via Tailhook Association*)

Another 'Death Rattlers' F-4B (BuNo 152218) went down on 10 January 1966 during one of the 587 combat sorties flown by VMFA-323 that month. The aircraft was mortally damaged by the premature explosion of one of its bombs near Phuoc Binh, but 1Lts G E Perry and R T Morrissey were quickly recovered despite injuries from landing on rocky terrain. Two weeks later, there was more evidence of improved VC accuracy with small arms when a round penetrated both canopies of an F-4B, injuring pilot 1Lt Dudley Weathers. Two others suffered extensive combat damage the following month.

By late February VMFA-323's groundcrew were already repainting six of their F-4Bs in 'Bengals'/'Flying Tigers' colours, ready for transfer to VMFA-542 upon its arrival at Da Nang in the first week of March. The 'Death Rattlers' duly departed for MCAS Iwakuni, where the unit's Phantom IIs were updated with the fitment of 'Shoehorn' RHAW. There, crews practised interception tactics with TF-9J 'targets' using Sparrow and Sidewinder attack profiles, before VMFA-323 sent 12 F-4Bs to Taiwan for a week of air defence duties in support of Chinese Nationalist forces. The unit was subsequently relieved by VMFA-314 and sent back to Da Nang, via Iwakuni, on 5 July 1966 to resume combat the following day with a four-aircraft road reconnaissance.

As previously noted Maj Fritsch's six-aeroplane Det Alpha contingent, and its six accompanying KC-130Fs, left for Chu Lai on 31 July. Just 16 days earlier, Fritsch and his RIO 1Lt C D Smith had been shot down on a mission from Da Nang when their F-4B (BuNo 150470) was hit on its second napalm pass northwest of Dong Ha during an Operation *Hastings* helicopter landing support mission. This was the only fixed-wing aircraft lost by the Marines during 1677 tactical missions that underpinned this extensive operation aimed at countering the movement south of the NVA's 324B Division. The crew ejected from their blazing Phantom II as it flew through trees, and they were rescued 30 minutes later.

VMFA-323 continued its high sortie rate through September, completing 726 missions in total – an average of 37 per pilot and 41 per RIO, using around ten aircraft daily. In addition to the 1097 tons of ordnance delivered, the squadron also fired more than 3000 rounds of 20 mm ammunition using Hughes Mk 4 HIPEG gun pods. Acquired to compensate for the lack of an internal gun, the Mk 11 Mod 5 gun was originally a vehicle-mounted, revolving cylinder-type weapon firing

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6000 rounds per minute. In its Mk 4 Mod 0 configuration, the 16.5 ft long, 1350-lb pod, with 750 rounds, could be mounted on the wing or fuselage pylons of A-4s, F-4s or OV-10As. A Skyhawk fitted with three pods and carrying 2250 rounds of ammunition was tested at NAS China Lake, California, in 1963, although the recoil effect was formidable. Marine Corps pilot John Trotti recalled, 'I fired one pod from an A-4, and in a ten-degree dive the little "Toot" damn near stopped dead in its tracks'.

The gun pod was, in many ways, ideal for CAS as VMFA-314 veteran Manfred Rietsch explained;

'The advantage of the gun pod was its great accuracy. You felt comfortable using it close to troops as there was little lateral error. The gun, with 750 rounds, gave you three to five passes – a long time to keep the bad guys' heads down. It was also an excellent weapon to go after targets on steep hills or on the face of sheer cliffs.'

Unfortunately, like its USAF SUU-16/A equivalent, the Mk 4 HIPEG was very prone to jamming after the first few rounds. Indeed, reliability fell well below 50 per cent at times, despite the best efforts of Hughes 'tech reps' and careful maintenance.

DEATH RATTLING

On 6 October 1966 the 'Death Rattlers' returned as a squadron to MAG-13 at Chu Lai, where the pace of operations was sustained into 1967, despite monsoon conditions. Many missions were required just to defend the base areas at Chu Lai and Da Nang against increasingly bold NVA advances, but saving Marines in jeopardy was a main priority, and the 14 February mission by Maj Andreas and Lt Clohessy in 'very foul weather' was typical. Operating in hilly terrain, with minimal visibility, they covered the helicopter extraction of a Marine Reconnaissance team that was surrounded by VC – 16 enemy fighters were killed by the F-4Bs' ordnance.

Operation *De Soto* (initiated in late December 1966, this was the last major battle for Marine units in the Quang Ngai Province of South Vietnam) required many sorties, and 14 February also saw Maj Wuertz and Lt Allen lead two F-4Bs on a CAS mission that enabled Marines to take two VC-occupied villages. The pilots had to dodge artillery shells being fired into the area as they bombed one village so that the Marines could enter it. Moments later the second encampment was also targeted.

The extraordinarily high mission totals (656 combat sorties for October 1967 alone) inevitably increased attrition, and one of those forced to abandon his jet was VMFA-323's squadron commander, Lt Col Gordon H Keller Jr. He was leading a pair of F-4Bs out of Chu Lai in heavy rain on 18 April when his aircraft's electrical systems failed completely. Resorting to hand signals to instruct his RIO, Capt Hugh Julian, to eject, he then found that his own ejection seat would not fire

The pilot's 'department' in 'Bengals" F-4B WH 2 at Chu Lai. The radome is open, revealing the 32-inch radar dish of the AN/APQ-72 equipment. Martin-Baker Mk H5 ejection seats are installed. Although the rear cockpit was more basic than the pilot's position, it still had 249 circuit breakers for the RIO to pull in various emergency drills, with some of them being very hard to reach (*Frank Shelton*)

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on the first two attempts. Lt Col Keller finally ejected moments before BuNo 151486 dived into the sea and he was rescued. Capt Julian had to wait nine hours before a shrimp boat found him with no life raft, radio or emergency light, and a broken arm.

The ever-changing situation on the ground meant that F-4 crews often had to change a mission profile at a moment's notice. Lt Conlon and Capt Hudson were diverted from a 14 April 1967 TPQ to make a single-aircraft attack on a VC trench and bunker complex that posed an unexpected threat. Although low on fuel, they made several passes, accounting for at least 35 VC fatalities.

On 26 August a section led by Lt K P O'Mara and Capt N E Douglas was scrambled from the CAS hot-pad to rescue Marines trapped in a narrow valley just 100 m from enemy forces. Making a series of low-altitude, lay-down deliveries, the two Phantom IIs eliminated the VC unit completely.

Another diversion on 13 October took the 'Death Rattlers" commander, Lt Col Edison Miller, and his RIO 1Lt James Warner off a DAS near the DMZ on a Seventh Air Force 'Tally Ho' mission to hit two tracked vehicles. Unfortunately, they were defended by 37 mm AAA, and F-4B BuNo 150477 was fatally damaged as it pulled up from a strike. Lt Col Miller followed the standard procedure of heading offshore to eject, but his aircraft crashed just short of the beach and the crew landed in a gully, from where they began to call in a rescue on their URT-10 survival radios. They were quickly captured by NVA soldiers, and Miller became one of a handful of PoWs who openly collaborated with staff at the 'Hanoi Hilton' prison, making propaganda tapes and anti-war statements – he also met Jane Fonda in July 1972. Despite his assertion that this was done 'as a matter of principle, and not to curry favour with his captors', he was shunned by other PoWs.

VMFA-542 'Bengals' began its second deployment to Da Nang on 1 March 1966, and by the end of that month the unit had flown no fewer than 709 combat sorties – the highest monthly total yet for an F-4B unit. By 15 November its total of ordnance dropped during the war topped ten million pounds.

Such intensive flying constantly exposed the Phantom IIs to ground fire, and in April 1966 alone nine aircraft received substantial damage ranging from two separate hits in the radome for BuNo 152236 to a three-inch hole in the stabilator from a 37 mm hit on aircraft WH 5. Bullet damage to flaps, ailerons and fuel tanks was common, but the F-4 was a tough bird and only one was lost during that month's 568 combat sorties. On 21 April WH 13 (BuNo 151010), flown by Capt F A Huey and 2Lt J L Arendale, took a 37 mm shell during a *Steel Tiger* night napalm attack on six trucks. Both crewmen ejected and were rescued, with burns, by a USAF HH-53C helicopter.

The 'Bengals' moved to Chu Lai for two tours beginning in October 1966. TPQ-10 missions continued to fill the monsoon period – of 524 VMFA-542 sorties in February 1967 (which included the unit's 6000th combat sortie), 226 were TPQs, and the squadron received no BDA for any of these. As squadron commander Lt Col Fred Farrell commented, 'On many of the more lucrative bombing missions the FAC was too occupied to report BDA'.

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Six LAU-10 pods armed with four Zuni rockets apiece provide a considerable punch for 'Silver Eagles" F-4B-15-MC BuNo 151013 as it rolls out for a sortie from Da Nang. Each of the 5-in unguided rockets was powered by a Mk 16 motor similar to that fitted in the AIM-9 Sidewinder. A Zuni weighed around 65 lbs and could be fitted with a variety of warheads, including Mk 32 anti-tank/anti-personnel, Mk 63 fragmentation, Mk 24 general purpose high explosive or Mk 34 incendiary. A loaded pod weighed about 650 lbs (*Tailhook Association*)

July 1967 was another month of record sortie rates, with 707 missions being flown by VMFA-542 in support of 13 separate Marine Corps operations for the loss of just one jet – the only 'Marine Air' Phantom II combat casualty for the month. As was the case on most F-4 CAS sorties, operational requirements obliged aircrews to overcome common sense and make repeated attacks against the same target. On 2 July, whilst in the process of making their *fourth* CAS pass against NVA troops that had caught two companies of Marines in open terrain near the forward Marine Corps base at Con Thien, Maj Ray Pendergraft and Capt David Spearman were killed when their F-4B (BuNo 151421) was hit and crashed into the sea attempting to reach Da Nang.

'SILVER EAGLES'

Few Marine Corps F-4 units saw as much combat as VMFA-115 'Silver Eagles', the squadron having first arrived in Vietnam on 15 October 1965. This signalled the start of a series of deployments that would keep the unit almost constantly in combat until August 1973, by which point it was one of the last Marine squadrons committed to the conflict. Inevitably, this exposure brought heavy losses – 23 aircraft and 21 aircrew during 34,000 combat sorties – but also an unprecedented period in which 10,000 combat hours were flown without accident.

In July 1966 VMFA-115 established an F-4B record of 1001 combat flight hours in one month, flying 717 combat sorties and dropping close to 1000 tons of ordnance. This rate was sustained over the following months under the leadership of former VMFA-314 executive officer Lt Cdr L R Van Deusen, who succeeded Lt Col Dean C Macho as squadron commander. Van Deusen emphasised continuation training, adding an 'emergency de jour' slot at the end of each briefing to cover anything from compressor stall to nose-gear failure. Even in December, when monsoon weather limited the majority of VMFA-115's missions to TPQs, the 'Able Eagles' still flew two CAS missions per day.

Two unusual losses had occurred in quick succession during May 1966, one (BuNo 152309) due to problems attributed to incorrectly rigged flight controls, and a second resulting in the loss of 1Lt Richard H Royer and 2Lt John Kramer, whose F-4B (BuNo 152268) just disappeared at sea whilst returning from a mission on 25 May.

After two deployments to Da Nang, VMFA-115 rotated from training at Naha to Chu Lai, via a non-stop flight from Iwakuni to Cubi Point, on 14 May 1967. Its equipment-bearing C-130s did not arrive in-theatre for a further 12 days, by which point the 'Silver Eagles' had already flown 283 CAS/

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DAS, LZ prep, TPQ and visual reconnaissance missions, as well as numerous Seventh Air Force assignments.

The effect of air strikes by VMFA-115 Phantom IIs on enemy troops could be devastating. Squadron commander Lt Col Carey led a section of F-4Bs armed with Mk 82s and gun pods on a Dong Ha CAS that cost the VC 195 killed by air (KBA). Another CAS in marginal weather by Capts F S Tener and N G Kerr on 10 September left 185 KBA or probably dead after repeated napalm and Mk 81 bomb runs that left both Phantom IIs badly damaged. The 'Silver Eagles' lost their first F-4B to enemy fire after nearly two years of combat on 29 September, BuNo 151429, flown by the squadron commander, Lt Col Kenny Palmer, and Capt Charles Cahaskie, being hit by AAA during a CAS mission close to the DMZ. Both men were rescued by a USAF HH-3 helicopter.

The following day, another VMFA-115 F-4B (BuNo 151020) was abandoned over the sea when one of its engines caught fire just after the jet had taken off from Chu Lai. This rare occurrence also cost the lives of two VMFA-542 airmen on 19 October 1967 when their F-4B (BuNo 151457) suffered engine failure as it lifted off at Chu Lai. Even the trusty J79 engines could be overtaxed by the extraordinary sortie rates, ambient heat and heavy combat war-loads imposed upon them.

The 'Silver Eagles' remained at Chu Lai for an unmatched 39 months of duty, maintaining punishing sortie totals with surprisingly few F-4Bs. For example, in December 1967 the squadron owned 20 Phantom IIs, of which only 13 were usually 'on board' (i.e. not off-base for maintenance or awaiting parts or repair at Chu Lai), but only five were available each day on average. With these jets the squadron still managed a total of 456 missions that month (roughly 27 sorties per day).

The other long-serving unit in the Da Nang-Chu Lai deployment rota was VMFA-314 'Black Knights', which first arrived at Da Nang from Iwakuni on 15 January 1966 and lost four experienced crew members on an LZ prep just nine days later. Two F-4Bs piloted by Capts Albert Pitt (BuNo 152265, with 2Lt L N Helber as RIO) and Doyle Sprick (BuNo 152276, with 2Lt D G Booze as RIO) are assumed to have collided, and no trace was ever found of their element.

Undaunted, VMFA-314 flew a record 605 sorties the following month. An additional 106 escort sorties for the EF-10B 'Whale' (a particular focus for the unit during pre-deployment training) were scrubbed due to weather. The crews of the two February losses were more fortunate than their predecessors. 1Lt John Pierce and 2Lt Billie Ellis were recovered on 24 February after F-4B BuNo 151411 was set ablaze by AAA on its fifth bomb-run. 1Lts Robert Pappas and John Coleman had a longer wait after small arms hits forced them to eject from BuNo 152308 five miles offshore the following day, although the destroyer escort USS *Falgout* (DE-324) eventually located them.

The squadron sustained two further losses during this action-packed first tour, both jets being hit by AAA at the most vulnerable moment – pulling out of a bomb run. The first came during Operation *Utah*, one of the many successful 'search and destroy' initiatives in which the Marines sought open combat with NVA forces. 1Lt T P Keenan and Capt C R Fairchild were on their seventh napalm pass against enemy trenches in BuNo 151453 when their luck ran out and automatic weapons fire knocked out their hydraulic

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Pfcs Michael D Patterson and Donald J Chattelle operate a fuel pump from Chu Lai's sandy terrain to fill a pair of 'Black Knights' F-4Bs in August 1967. At Da Nang VMFA-531 used between 25,000 and 55,000 gallons per day. VW 8 (right) has a Mk 4 gun pod on its centreline pylon. During the monsoon season, when even helicopter flying could be dangerous, pilots became used to cloud bases at 100 ft and visibility reduced to less than 3000 ft. Similar conditions often prevailed at Da Nang, where VMFA-122 crews became adept at using their radars for landing approaches (*Cpl Russ Cowan via Peter Mersky collection*)

systems. They made it to the coast and a Marine Corps UH-34 pulled them out of the sea. Maj E C Paige and his RIO, WO D D Redmond, were less fortunate on a 14 March night *Steel Tiger* mission in Laos. They spent an anxious night evading pursuit by enemy search parties before a USAF helicopter successfully extricated them.

VMFA-314's second period at Da Nang began on 1 August 1966 with 16 aircraft of the 20 assigned – each F-4B subsequently averaged a staggering 66 sorties per month. With no facilities for engine overhaul and very basic provision for maintaining the Phantom IIs' sensitive avionics, the groundcrews worked perpetual overtime to keep as many jets as possible serviceable.

Former 'Black Knight' John Trotti quipped 'When we picked up brand new BuNo 152 series F-4Bs in 1965 you could lock up the planet Pluto with their radars. By March 1966, if the Goodyear blimp got in your way at five miles the RIO wouldn't have had a clue'. Manfred Rietsch also remembered the F-4 as a 'maintenance challenge. Every 20 to 30 flights you could count on a utility or PC [hydraulic] failure. The tube radios, TACANs, etc. had a meantime between failures of perhaps 30 or 40 hours. The early AWG-10 radar in the F-4J Phantom II would perhaps stay "up" for one or two flights. For the F-4 you were looking at 40+ maintenance man hours per flight hour.

'VMFA-314 at Chu Lai would fly about 800 hours per month. We would start the day with about 14 to 16 aircraft (out of 20) available. By the end of the day schedule you had about six or eight for your night sorties. Then the miracle workers would slave all night, and you would be back to 15 or so by the morning.'

Some of the routine tasks were particularly irksome, such as removing the rear ejection seat to change the radio (a five-hour job) or retrieving the drag 'chute from behind the aircraft while the engines were still running and later untangling and re-packing the parachute in the small tail compartment. If the aircraft had to land at a 'non-Phantom II' base, the aircrew usually had to do this themselves.

Lt Col Darrell Bjorklund moved the VW-coded F-4Bs to Chu Lai on 25 September, from where they flew two more tours without loss until 18 March 1967, when Maj David Morrill and 2Lt Maxim Parker in BuNo 152271 were either hit or experienced target fixation on their fourth pass at an automatic weapons site. It was the only loss during 552 sorties that month, but taking on automatic weapons was inevitably one of the riskiest tasks required of the Phantom II crews, as the 16 May loss of BuNo 152266 showed. Capt C E Hay and 1Lt M Carson were rescued after terminal 'Alpha' damage to their F-4B on its third pass against a deadly 0.50-cal AAA site. However, an unprecedented 730 sorties were flown that month and 1629 tons of ordnance delivered. The squadron withdrew to Iwakuni in August, but returned to Chu Lai once again on 16 November 1967.

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THE TOUGHEST YEARS

The assaults on US bases in 1967 led to a more sustained campaign, with North Vietnamese Gen Vo Nguyen Giap, architect of the defeat of French forces in Vietnam at Dien Bien Phu in 1954, planning to capture key American and South Vietnamese positions. He was encouraged by the capture of the Special Forces camp in the A Shau Valley in March 1966, where Marine Corps and USAF tactical air power operating in terrible monsoon conditions was unable to prevent the base falling to a well-planned assault by the NVA's 325th Division. His strategy allowed for colossal casualties – at Dien Bien Phu more than 23,000 Viet Minh troops were killed.

Central to Gen Giap's 1967 plan was an attempted 'American Dien Bien Phu' focused on the crucial Marine Corps base at Khe Sanh. Although the NVA ultimately failed to capture the camp, suffering massive casualties in the process, the propaganda effect of this and the January 1968 Tet attacks did much to undermine American public support for the war. The immediate outcome was 'the period of greatest combat activity of the war' (from January to late August 1968) according to the Marine Corps' Gen Edwin Simmons.

Khe Sanh, occupied by three battalions of the 26th Marines (later reinforced by two more), was in a crucial position – like A Shau – for monitoring the Ho Chi Minh supply trails network from Laos and the north into South Vietnam. In Gen Westmoreland's opinion, the loss of Khe Sanh would have given the North Vietnamese 'an almost unobstructed invasion route into the two northernmost provinces from which they might outflank our positions south of the DMZ'.

NVA attacks began on 24 April 1967, but the Marines, in surprise counter-attacks, re-took strategic hills around the base. The 1st MAW played a major role in this success, with more than 1000 CAS/DAS sorties being flown by F-4Bs, A-4s and newly-arrived A-6A Intruder unit VMA(AW)-533. At the beginning of the year the Marine Corps had 21 of its 36 battalions, 14 of its 33 fixed-wing squadrons and half of its 24 helicopter units in Vietnam – a much higher proportion than for any other US service.

By November 1967 the North Vietnamese had placed up to eight divisions close to Khe Sanh, but they waited until the heavy monsoon on 21 January 1968 before opening their attack by destroying Khe Sanh's main artillery ammunition store. Col Art Schmagel's MAG-11 at Da Nang responded quickly, using its A-6A squadron and two fighter units – VMFA-122 'Crusaders' with F-4Bs and VMF(AW)-235 'Death Angels' with F-8E Crusaders. At Chu Lai, Col Dean Wilker's MAG-13 included VMFAs -323, -115 and -314 with F-4Bs, as well as three A-4 squadrons and a solitary A-6A unit.

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Part of Gen Giap's plan was to hamper these forces by concentrated attacks on their bases during the Tet holiday. A VC force unsuccessfully attempted to capture I Corps' ARVN headquarters at Da Nang on the night of 30 January, whilst 2500 NVA troops were also prevented from capturing Da Nang city. However, two of VMFA-122's F-4Bs (BuNos 151407 and 152273), an A-6A and a USAF F-4C Phantom II were destroyed by mortar and rocket attacks on the base.

'Death Rattlers" F-4B-15-MC BuNo 151459/WS 11 is armed with 12 Mk 82 Snakeye bombs. The lack of SATS mechanical ordnance loaders at Da Nang and Chu Lai, together with an exhausting sortie rate, meant that much of the heavy ordnance had to be uploaded by hand. (*Frank Shelton*)

The 'Crusaders' had arrived at Da Nang in September 1967 under the leadership of Lt Col John M Verdi, a Reserve officer who had fought the Viet Minh at Dien Bien Phu. The following month's missions included ten BARCAP (barrier combat air patrol, protecting naval vessels or strike aircraft from enemy air attack) sorties for Marine Corps A-6A/EA-6A Intruders and EF-10B 'Whales' on *Rolling Thunder* missions over North Vietnam, one of them against Phuc Yen MiG airfield on 25 October. Although a VMA(AW)-533 Intruder was threatened by VPAF fighters, the Phantom IIs were not required to engage. This mission was the first time the Marines had used the F-4B's primary air-to-air, all-weather capability in combat.

Col Naviaux flew both day and night BARCAP in Vietnam;

'We never had a contact at night, and it was the TARCAP [target combat air patrol] who had all the action during the day. I do not think the VPAF ever launched a MiG at night during this period of the war. We were there at night mainly as bait so that the EA-6As could fire Shrikes at the SAM batteries as they tried to find us with their radar. Even so, to hear *Red Crown* during the day call "*Red Crown* on Guard. Bandits, bandits, bandits, 20 South, heading 140" did produce a blood-pressure spike even when I was 80 miles distant.'

Many of the missions flown by VMFA-122 during 1967-68 had been TPQs or *Steel Tiger* strikes in Laos. One of its F-4Bs (BuNo 148388) was set ablaze during just such a 'trails' mission on 22 December 1967. RIO 1Lt Guy Lashlee was rescued by a Marine UH-1E from Khe Sanh, but pilot Capt Gary Fors was reportedly captured and killed – the fate of many US aircrew who had the misfortune to eject over Laos. Another F-4B (BuNo 149440) burned out on 3 December when a tyre burst on takeoff, and the VC destroyed VMFA-122's BuNo 151447 in a rocket attack on the squadron's hangar at Da Nang on 3 January 1968 – a precursor to the Tet attacks at month-end, mentioned earlier in this chapter.

A determined NVA rocket and mortar attack on Da Nang destroyed four aircraft on the night of 29/30 January 1968, including VMFA-122's BuNo 151407/DC 1. Another squadron F-4B, BuNo 152273, an A-6A and a 366th TFW F-4C were also burned out and one US serviceman was killed. The heat from the conflagration distorted the metal walls of DC 1's revetment (*Tom Idema*)

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There was still time for BARCAPs over Route Pack VI in North Vietnam in early February 1968, but increasingly the F-4B units threw themselves into the furious defence of Khe Sanh, and the hills around it, in Operation *Niagara*. Marine jets joined others from the USAF and US Navy in attacks around the base, while B-52D *Arc Light* cells blasted NVA forces and approaching reinforcements further out.

The 'Crusaders' flew some very early Phantom IIs in 1967-69, including this F-4B-7-MC BuNo 148388 from the first production block of 72 F4H-1Fs. Delivered to VMFA-122, it was hit in the wing by 23 mm AAA during a *Steel Tiger* road strike in southern Laos on 22 December 1967. Fire spread quickly and the crew ejected. RIO 1Lt Guy Lashlee was recovered but pilot Capt Gary Fors was never seen again (*USMC*)

The 'Crusaders' flew 628 sorties that month and 653 in March (229 of them at night), with crews far exceeding their previous totals for ordnance delivery. Five aircraft were damaged, one after flying through trees on a napalm run, another when a napalm canister detonated while still on its LAU-17 pylon (luckily the pylon and 'nape' fell off) and a third when numerous pneumatic lines were severed by 0.30-cal rounds. Lt Col Naviaux remembered a VMFA-122 wingman who 'flew through trees and came back with the tops of all the napalm tanks still attached to the airplane. There was no ignition – all I saw was white spray. Napalm is actually fairly hard to ignite, and we had a lot of duds from faulty detonators'. The squadron's 12 available Phantom IIs were severely overworked during this period due to VMFA-122's remaining four jets being repeatedly 'down' with persistent hydraulic drive compressor failures.

Like Da Nang, Chu Lai was also attacked on the night of 30-31 January, and three VMFA-314 F-4Bs (BuNos 151508, 152287 and 152289) were destroyed and two more severely damaged in a barrage of 48 122 mm rockets. The squadron had already been operating with only six aircraft for much of January. The bomb dump exploded during the attack, killing VMFA-314's flight surgeon, Lt Stanley Lewis, together with VMFA-323 pilot Capt Arthur De la Houssaye and RIO 1Lt Richard Kerr. However, the 'Death Rattlers' launched aircraft from the beleaguered base just a few hours later.

VMFA-323's CO, Lt Col Harry Hagaman, had had a lucky escape south of Khe Sanh eight days earlier, on 22 January, when his F-4B (BuNo

F-4B-6-MC BuNo 148377 sits ready on the ramp, armed with a Mk 4 gun pod, Mk 82SE bombs and a solitary AIM-9B. In April 1968 a 0.30-cal bullet penetrated the jet's service access door 22 and severed a number of pneumatic lines. Despite the damage, DC 6 returned to base (*National Naval Aviation Museum*)

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151414) was hit by a burst of 0.50-cal fire while making a low-altitude 'nape and Snake' run against AAA positions. The squadron annals recorded that 'Capt Dennis Brandon, a back-seat veteran with more than 300 missions to his name, knew instantly when he heard the series of ominous "thuds" that the Phantom II had been mortally wounded. He quickly ejected.

'Lt Col Hagaman stayed with the bucking F-4 momentarily in a vain effort to stabilise the aircraft by using the rudder. The delay almost cost him his life because the F-4B began to tumble end-over-end barely 100 ft above the ground. Suddenly, the world outside became a spinning blur of blue and green. The second time that he saw green – indicating that the aircraft was inverted – Hagaman started to pull his alternate ejection handle, which was located between his knees. In the second that it took the escape mechanism to function the Phantom II flipped upright and the ejection cartridges blasted the pilot from the flaming cockpit. Seconds later the jet cart-wheeled into the ground.'

Lt Col Hagaman, the third 'Death Rattlers' commander that had been forced to eject from an F-4 during the war, was soon recovered by a Marine Corps helicopter and returned to duty. Lt Col T J Lyman remembered Hagaman as being 'a hands-on CO. He stood many "hot-pad" tours, one of which led to his shoot-down'.

Many of the strike missions undertaken at this time required unusually precise timing and target identification. For example, in February 'intel' learned of a meeting of NVA commanders and officers in a schoolhouse near the Laotian border. Exactly 20 minutes after this conference began the building was hit by four Marines F-4Bs and two A-6As with maximum loads of Mk 82 bombs. Heavy artillery followed up with 350 rounds.

Bad weather made TPQ essential for most Khe Sanh strikes, although when possible Marine TA-4F Skyhawk and O-1C Bird Dog FAC(A)s were also used. Increased AAA in the area resulted in frequent aircraft damage – nine VMFA-323 Phantom IIs were hit in February alone. They were particularly vulnerable on low-altitude, ten-degree angle 'soft ordnance' deliveries. 'Most of our sorties used 250-lb Snakeye and napalm. TPQs used hard ordnance, usually 500-lb bombs with delayed fusing', explained Lt Col Lyman.

In an effort to blunt the AAA threat, 'Death Rattlers" executive officer, Maj Paul Boozman, led a hot-pad F-4B section scramble on 14 February

Zuni rocket warheads project from beneath the wings of F-4B-13-MC BuNo 150466 over Vietnam during a 1968 sortie from Chu Lai. The hard-working 'Black Knights' averaged 575.5 combat sorties per month that year, with a peak of 793 in April, when the squadron's pilots each flew an average of 55 missions. At the beginning of the year these rates were often achieved with only six available aircraft (*Mule Holmberg via Tailhook Association*)

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that destroyed three gun batteries. VMFA-314 also focused considerable effort on anti-AAA measures, its ordnance shop devising a way of using an LAU-3/A launcher on the inboard LAU-17 pylons to provide another Zuni-launching position for strikes against gun batteries.

At this time no less than 65 per cent of the unit's sorties were flown in support of Operation *Niagara*, and up to ten 'Black Knights" F-4Bs would be in the air at any one time. Unsurprisingly, the squadron expended more than 1500 tons of ordnance in March 1968, contributing greatly to the 'moonscape' that surrounded the Marine base at Khe Sanh.

From Da Nang, VMFA-122 flew 214 *Niagara* sorties in March, and nine 0.50-cal gun positions were among the targets its crews destroyed. The following month a spring counter-offensive, codenamed Operation *Pegasus*, included the relief of Khe Sanh, where the Marines continued to hold out. VMFA-122 completed another 542 sorties in April, and its tough Phantom IIs absorbed damage from close-quarters in low altitude strikes that often saw ordnance dropped within 50 m of the base perimeter as the NVA extended its entrenchments ever closer to the Marines. The crew of F-4B BuNo 149453 made no fewer than 12 runs at targets before retiring with a 0.30-cal hit in the nose – six or seven passes at the same target were not unusual.

VMFA-115 kept up the pressure during this period by expending an average of 52 tons of ordnance daily, although the unit was committed to ten separate operations and also had to keep the air-to-air hot-pad active, all with just ten Phantom IIs. In April, with better weather, eight of VMFA-115's F-4Bs passed the 200 mission total. Many of these sorties were like the 15 April flight by Maj J W Moore's section, which dropped 16 M117 bombs on a tunnel and bunker complex near Gio Linh, causing considerable destruction and secondary explosions. April also saw Lt Col Herbert Lundin's 'Black Knights' hit new monthly records of 793 combat missions and 2246 tons of ordnance – an average of 55 missions per pilot and 62 for RIOs – without loss.

The NVA continued its resistance, however, damaging five of VMFA-323's F-4Bs. As Lt Col Hagaman observed in April, 'Charlie's on-the-job

F-4B-18-MC BuNo 151450 boasts the 'Shoehorn' ECM installation and full 'Death Rattlers' markings, apart from a borrowed wing tank from VF-121. 'Shoehorn', installed in 1967, included AN/APR-25 radar homing and warning and AN/APR-26/27 SAM launch warning equipment, with antennas under the radome and on the fin cap. Transferred to VMFA-314, this aircraft was lost in the tragic mid-air collision between a VMFA-542 F-4B and a KC-130F tanker on 18 May 1969 (*by kind permission of Susumu Tokunaga*)

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F-4B-27-MC BuNo 153037 demonstrates the 'Black Knights" February 1968 field modification that enabled a LAU-3/A launcher with two additional Zunis to fire from the AIM-9 station on the inboard pylons. This aircraft was over-rotated to too steep a takeoff angle when departing NAS Cubi Point for Chu Lai on 16 May 1969 and the crew had to eject when the Phantom II stalled (*National Naval Aviation Museum*)

training is paying off as he has received more, and better, weapons, and seems to be more effective in their use'.

By 14 April Marines had re-taken positions around Khe Sanh, which brought an end to the 77-day siege. *Pegasus* had convinced the NVA to withdraw, rather than increase its death-toll, which stood at more than 5000. Despite 'Marine Air' tactical aircraft averaging 300 sorties per day – one every five minutes – during the operation, only an F-4B and an A-4 had been lost. Yet despite *Pegasus* having come to a successful conclusion, the pressure on the Phantom II squadrons scarcely abated.

Operation *Delaware*, from 19 April, set out to re-take positions in the A Shau Valley in a massive Spring offensive. As a direct result of this new campaign, the 'Death Rattlers" activity actually increased in May, with 589 combat sorties being flown – including several against 122 mm rocket sites within sight of Chu Lai airfield after MAG-13 aircraft had again been damaged on base. One rocket, according to records, 'impacted 50 m from the squadron ready room but caused only an increased interest in secure bunkers'. The plentiful sand at Chu Lai absorbed many of the impacts, as well as entering cockpits, mouths and lungs – it also provided plenty of filling for the abundance of defensive sandbags on base.

A wingman's view of Mk 82 SE 'Snakes' falling from F-4B-15-MC BuNo 150652 on a TPQ-10 radar-controlled drop in 1968. Although the Phantom II's cockpits were quite spacious, the RIO's rearward view was restricted, as Gen Nyland explained. 'You had to lean way out forward to turn and see backwards. With the Martin-Baker H5 seat it was really hard to pull out as much shoulder harness as possible to do this. The H7 seat was better for that.' Access to the many circuit breakers in the rear cockpit also posed difficulties. 'You had to bend yourself like a pretzel, and if you had to reach the lower panel of circuit breakers, that was a helluva reach. Some guys took along a spoon with a hole drilled in it so that it would fit over the breaker to pop it out' (*Tailhook Association*)

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A heavily armed element of 'Bengals" F-4Bs is followed out to the Da Nang runway by solitary F-4B BuNo 149403 from VMFA-122 in early 1968, while another aircraft returns from its mission. DC 12, with its drag 'chute door open and an unused Mk 82 bomb, has borrowed a wing tank from the Da Nang-based 366th TFW, this USAF unit being equipped with F-4D Phantom IIs (*Tom Idema*)

VMFA-323 responded to these attacks with some deadly CAS. A 29 May mission led by Maj E R Bailey in support of the 5th Marines near Truoi River elicited the following comments from Brig Gen G D Webster, Assistant Division Commander of the 1st Marine Division;

'Examination of the battlefield following the action resulted in visual testimonial to the precision with which CAS was delivered. The area occupied by the enemy was completely devastated, while the surrounding populated area was untouched. Responsive CAS and helo support contributed to 58 enemy dead and 38 weapons captured.'

In May the 'Black Knights' also hit a new high of 696 combat sorties – their fifth month at the top of the statistics tables. Many were short-range stabs at encroaching VC, such as the napalm strike on 1 May when Capt D C Evans' BuNo 149424/VW 6 was shot down just 12 miles from Da Nang – he and RIO 1Lt I F Hunsaker successfully ejected and were rescued by a USAF helicopter.

In a similar mission 17 miles southwest of Da Nang on 2 August, Maj D J Carroll attempted to recover 'Death Rattlers" F-4B BuNo 149449 after it was hit on its sixth napalm pass. He managed to get the burning Phantom II back to Chu Lai, but the landing gear refused to extend. The arresting wire snapped when his hook engaged it, and the jet continued to plough along the runway on its wing-tanks. Maj Carroll lit both afterburners and hauled the F-4 back into the air so that he and RIO 1Lt R C Brown could eject over water – this was Carroll's second water extraction, as he and RIO Capt J J Hare had punched out of AAA-damaged BuNo 151423 on 29 October 1967. Carroll described the 2 August experience as 'a great testimony to General Electric engines'.

B-52 escort missions were added to VMFA-115's schedule in May due to a greater threat of MiG interception over Laos as the SAC bombers increased their *Arc Light* sortie rates, but CAS still comprised the bulk of the unit's work that summer. During 703 combat sorties in August, the 'Silver Eagles' inflicted real damage to the VC's infrastructure of bunkers, storage areas and tunnel networks. That same month in VMFA-314, maintainers struggled to keep nine of the unit's 20 assigned F-4Bs available, and each aircraft flew an average of 66 sorties (at least two per day) in August.

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Chu Lai strike partners – VMFA-314's F-4B-27-MC BuNo 153037 and VMA-311's A-4E BuNo 152070 – go looking for targets in 1968. The Skyhawk features the upgraded A-4F-style dorsal avionics pod. VMA-311 'Tomcats' served in Vietnam from June 1965 until 30 January 1973. VMFA-314 was undertaking its third combat tour when this photograph was taken, VW 00 being assigned to MAG-13 CO, Col Norman W Gourley, at the time. This group, with three F-4 Phantom II squadrons, shared Chu Lai with Col Rex Deasy's MAG-12 (this particular A-4 bears his name beneath the cockpit), which controlled four A-4E/C units and VMA(AW)-533's A-6A Intruders (*USMC*)

VMFA-323 began its 14th consecutive month of combat in September, with both air-to-ground and air-to-air hot-pads constantly in operation. For the latter, up to six crews sat in a small, poorly air-conditioned trailer close to their pre-flight checked Phantom IIs for 'prime', 'secondary' and 'back-up' alert, depending on the ground commanders' needs. The 'prime' section would normally get airborne and over the target within 15 minutes or less, flying a mission that usually lasted roughly 45 minutes. While awaiting the call, crews kept themselves amused with 'acey-deucey' and other card games, or by re-reading precious letters from home.

At Da Nang, VMFA-122's armament team devised a three gun-pod wiring configuration for BuNo 148378 (dubbed the 'F-4V' in honour of squadron CO, Lt Col John M Verdi), giving a combined rate of fire of 6300 rounds per minute from pods on the centreline and wing stations. The configuration reportedly made the F-4B 'an outstanding gun platform', although the recoil effects, particularly if one wing-mounted Mk 4 pod jammed, required careful management. Col Jacques Naviaux flew with VMFA-122 at this time;

'We had been the first, and probably the only, F-4 squadron to use the gun pod for air-to-air gunnery in Stateside training – our wonderful executive officer, "Bear" Waldvogel, had spectacular aerial gunnery scores. And Lt Col Verdi liked firepower. If one gun was good, three were better. The gun was seldom used by most other units because of a well-deserved reputation for jamming after firing about ten rounds. We had a sergeant in VMFA-122 who loved that 20 mm gun pod, and he made them work. We went from averaging ten rounds between stoppages to 14,000 – an effort entirely attributable to our dedicated and totally superior Marine Corps ordnance sergeant.

'The gun had another problem. We started picking up what we thought were hits from enemy fire on the radome. However, the pattern of hits was associated only with gun firing. It was determined that the high-explosive rounds were tumbling and detonating in front of the aircraft, so we were taking shrapnel hits from our own ammunition.'

The squadron fired more than 43,000 rounds in May 1968 alone, many of them against enemy forces close to Chu Lai. Gen William 'Spider' Nyland attributed the squadron's gun pod success to Verdi's determination to 'put the manpower on it and keep it lubricated and tuned up. Operating

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By the end of October 1968 half of VMFA-115's available F-4Bs had had the Martin-Baker Mk H7 zero-zero ejection seat installed during maintenance in Japan. They had also received 'airframe change 400', which incorporated utility hydraulic pressure into the flight control system. It was also a time when several F-4Bs shed cockpit canopies in flight. Some losses were attributed to Chu Lai sand jamming the locking system. Several F-4Js required new canopies during VMFA-334's deployment after they were scratched deeply by fragments from 2.75-in rockets that had disintegrated on launching (*Author's collection*)

out of Chu Lai, there was so much sand, grit and crud in the air that it would just jam up – the weapon was quickly dubbed the "1000-lb single-shot rifle". There was a place for it in CAS, but mostly we relied on "nape and Snake"'.

Col Naviaux added;

'Verdi also had us use weapon deliveries that were unique in the F-4 community. Loft bombing [initially developed for nuclear delivery] with conventional ordnance was one of them – putting the airplane into a manoeuvre called a "half Cuban Eight". The pilot pulled up into a loop and completed five-eighths of the manoeuvre before rolling upright and continuing on down at a 45-degree angle until pulling out at the entry altitude. Bombs were released at the proper point of the manoeuvre, and they continued to the target while the strike aircraft went in the opposite direction. Verdi's very sound theory was that any technique that could put ordnance on target with minimal risk to the aircrew was a good one.

'Loft bombing was initiated at 500 ft AGL at 500 knots. With an initial 4g pull-up, the weapons had a down-range travel of about 25,000 ft, giving the crew a good stand-off delivery distance against AAA. Verdi's original thought was to use cluster bomb units (CBUs), but they were restricted from use in this type of delivery. The CBU we used consisted of a case that contained 685 tennis ball-sized bomblets that exploded on contact. Dropping 12 CBUs would send 80,220 explosive devices at your enemy. That tended to make them keep their heads down.'

Rocket attacks continued throughout 1968, and when advanced warning could be gleaned from informers of large convoys heading south along the Ho Chi Minh Trail, some of VMFA-122's Phantom IIs were dispersed to Korat or Ubon RTAFBs for a day or two. During one such

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Mk 82 LDGP bombs fall from the pylons of this VMFA-115 F-4B-26-MC on a TPQ-10 radar-bombing mission above a thick cloud-base. The aircraft's chaff dispenser door (above the MARINES titling) is open and its inner LAU-7 pylons have two-tube LAU-33 Zuni launchers attached, suggesting that the crew may have been diverted from a CAS mission to fly this TPQ drop in a high-risk SAM area (*USMC via Peter Mersky collection*)

detachment eight aircraft were tasked with Seventh Air Force 'seeding' operations around Song Ben Hai with Mk 36 mines – not the ideal role for the F-4B, although the accompanying 'Crusaders' flak suppression flight silenced a 37 mm site.

On 8 July VMFA-122's Lt Col E R Howard joined the list of shot-down squadron commanders when his F-4B (BuNo 148432) was hit at 400 ft on its eighth strafing pass against a target only three miles from Da Nang. He and RIO Capt R D Hess ejected over the sea. Nine other F-4Bs were struck by enemy fire that same month, with damage ranging from a 23 mm shell through the pilot's canopy, cutting the drogue 'chute line on his seat, to a wing-pin unlock cable being severed by a 0.30-cal bullet.

The 'Crusaders' sustained one more F-4B loss to 0.50-cal fire on 8 August (BuNo 148420 during its third napalm run – Capt C R Cusack and S M Creal ejected and were rescued) before returning to Iwakuni 21 days later.

The Chu Lai squadrons still had many months of combat ahead, with weather proving to be a major opponent. Capts Yatsko and Derby launched as 'Lovebug 411' on 21 October with a 2500 ft cloud ceiling that ruled out conventional bombing. Diverted to Camp Carroll TPQ control, they found themselves performing a high-altitude radar run in a high-threat SAM area north of the DMZ instead. Capt Paul Derby was subsequently lost on 17 November near Ha Thanh when the cockpit of 'Silver Eagle' BuNo 149456 was hit by AAA as he and 1Lt Thomas Reich made their first napalm run at just 500 ft. With the pilot possibly incapacitated, the jet flew straight in and both men were killed.

Some had far better luck. A few days later squadronmate Maj J N Bibler, whose F-4B (BuNo 151467) had been the only loss during the Khe Sanh operation on 4 July, flew his 447th mission. Sadly, his RIO on the Khe Sanh shoot-down, Capt Daniel Coonon, was killed when his F-4B (BuNo 152329), flown by Capt J W Jones, failed to pull out of a dive during CAS just 15 miles southwest of Da Nang on 8 October.

A remarkable 'save' by VMFA-314's Maj Carl E R Black and 1Lt R G Schmitt left F-4B-26-MC BuNo 153006 with only 'Echo' (minimum) damage after they landed it on Chu Lai's foamed runway on the nose gear and starboard main landing gear. A hydraulic problem had prevented the port main gear from extending at the end of Maj Black's 300th, and last, combat mission on 1 November 1968 (*1st MAW SSgt C M Hoar via Peter Mersky collection*)

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Wall-to-wall Mk 77 napalm and Zunis on a VMFA-115 F-4B for a 'hot pad' CAS mission. Often, the more lucrative targets were well hidden. On a 26 February 1969 mission two F-4Bs destroyed 41 light buildings in Quang Ngai Province and killed 12 enemy troops, but a large secondary explosion uncovered several cases of M60 ammunition and hand grenades for Marines on the ground to capture (*USMC*

In November 1968, as President Johnson's bombing halt over North Vietnam came into effect, the Chu Lai squadrons received orders which, in the words of VMFA-323 CO Lt Col Don Slee, reduced the 'pace of flight operations to a slower tempo in order to reduce non-combat aircraft losses'. In fact, only two Chu Lai aircraft had been non-combat losses in the previous two months, so the directive was presumably a political one.

Although the 'Death Rattlers" mission total fell to 359 in November, the sorties being flown were still tough, including a 19 November flight by Lts Murphy and Sprague and their wingman that saw them forced by weather to make shallow-angle attacks with hard ordnance. Nevertheless, they still placed 90 per cent of their bombs on target, destroying

VMFA-115's armament crew load Mk 82 Snakeye bombs on F-4B-13-MC BuNo 150455. Twin-Zuni LAU-33 launchers are in place on the Sidewinder rails of the inner LAU-7 pylons of VE 17. The squadron marked its 10,000th accident-free flying hour in Vietnam on 23 February 1970 (*Peter Mersky collection*)

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14 bunkers and seven cave storage sites. The same team's accurate bombing destroyed four trucks and caused eight large secondary explosions in a 'trails' truck park on 15 March 1969. With them as wingmen on this occasion were 1Lts W C Ryan and Gary Bain, who had been forced to eject from BuNo 151441 on 12 January when it caught fire after they attempted to jettison 'hung' ordnance. This proved to be VMFA-323's 11th, and last, wartime loss, despite the unit spending the weeks up to its return to El Toro (on 25 March) in renewed activity, with a record 586 sorties being undertaken in February.

Devoid of weapons, F-4J-29-MC BuNo 153796 of VMFA-334 approaches the Iwakuni runway in 1969. Combat was hard on the Phantom II's reliable J79 engines, with frequent use of afterburner and turbine exhaust gas temperatures of 625 degrees centigrade. Deep engine maintenance would take a team of about five mechanics up to three weeks to complete (*by kind permission of Susumu Tokunaga*)

Combat continued for VMFA-314 too. On 28 January 1969 Capt S R McComb and 1Lt T R Johnson flew the squadron's 9000th combat hour. That month 546 missions were flown, despite the heavy monsoon. In March the 'Black Knights' received the Robert W Hanson Award for the Most Outstanding Marine Fighter Squadron, an honour reflected in the 741 missions VMFA-314 flew the following month.

Sadly, on 18 May, the unit was involved in one of the worst accidents of the war. Two 'Black Knights' F-4Bs, outbound on a mission, were refuelling from a KC-130F when a VMFA-542 Phantom II (BuNo 151001) on an orientation flight for 1Lt Charles Piggott hit the tanker head-on near its No 3 engine. Maj J D Moody and 1Lt R R Griffiths jettisoned their bombs and ejected from their damaged F-4B (BuNo 151450), while the other jet, crewed by Major A Gillespie and 1Lt V R Maddox, returned to base with minor damage. The six KC-130F crewmen (from VMGR-152) and the VMFA-542 crew, including Capt John Nalls, who had flown a highly successful DAS sortie four days earlier, were all killed.

VMFA-314's rate of more than 600 missions per month was sustained through the summer, and several crewmen passed their 400th mission, while 1Lt Dick Kindsfater topped 600 in October – a record for one 13-month tour. Reduced enemy activity had relaxed the frenetic pace a little by year-end, although the number of night MiGCAP/BARCAPs

Three VMFA-334 jets head off to battle with Snakeye ordnance. Two of these Phantom IIs served for long periods post-war, while the most distant machine, F-4J-35-MC BuNo 155788/WU 12, was the squadron's last of five losses in its year of combat at Da Nang and Chu Lai (*USMC*)

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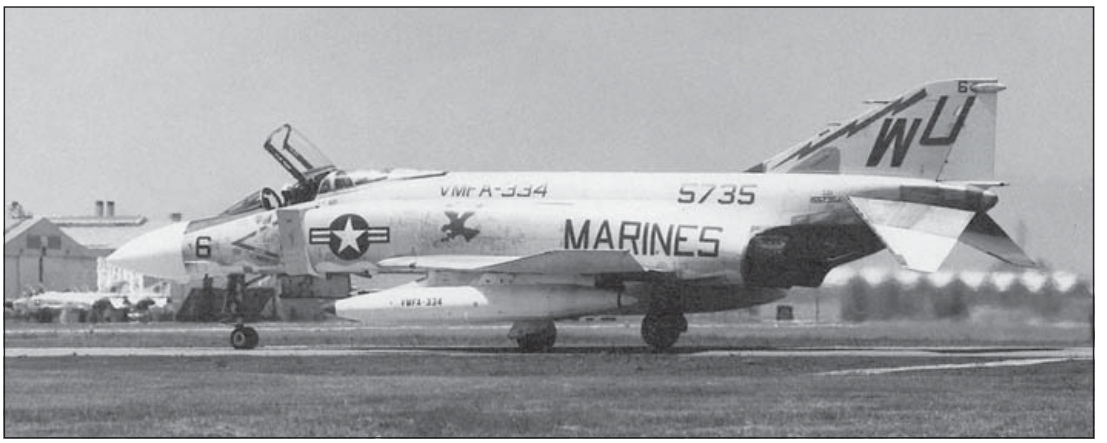

The pilot of this 'Falcons' F-4J-34-MC BuNo 155735 was in luck on 17 March 1969 when a bullet impacted the left side of his seat without causing injury or igniting any pyrotechnics. The jet's vertical stabiliser also appears to have a patched area of damage. Many mid-1960s *Steel Tiger* night missions in Laos used four F-4s making up to six runs each at flare-lit targets. Later in the war two-aircraft sections were more common (*USMC*)

increased, many of them for B-52s operating over Laos. January 1970 saw VMFA-314 return to the relentless cycle of CAS missions, which resulted in the unit completing 704 sorties that month. In February two F-4Bs were downed by their own napalm conflagrations when Mk 77 tanks were ignited on the aircraft, possibly by small-arms hits on the fuses. The crews of BuNos 149467 and 150427 all escaped uninjured.

Missions in the II Corps area began in April 1970, with VMFA-314 contributing to the relief of the beleaguered Dak Saeng and Dak Pek outposts. In May the 'Black Knights' flew their first covert sorties over Cambodia as part of the extraordinary 762 combat mission tally achieved that month – the highest for any Marine F-4 squadron. VMFA-314 also escorted TA-4F 'Playboy' FACs over Laos in the unit's final months, before returning to El Toro on 12 September.

VMFA-115 had already completed the last of its 27,892 combat sorties from Chu Lai on 23 August, this historic mission being led by Maj H T Berwald. The 'Silver Eagles' were then reassigned to MAG-11 at Da Nang.

Like other squadrons, VMFA-115's achievements were measured in statistics – the number of missions flown, bunkers, structures and metres of trench-line destroyed and enemy killed. Occasionally, some bizarre details were logged. For example, Maj D P Bowen's 15 August 1969 mission included 'one KBA impaled by a dud Mk 82' in its assessment, while other squadrons noted such items as a 'VC flagpole' and a 'VC training cinema screen' destroyed. Other targets were more obviously profitable, such as the 'Manual 41' *Steel Tiger* of 26 November 1969, led by VMFA-115 CO, Lt Col Edwin Paige. FAC 'Nail 16' directed them against five trucks stalled on Route 917. They hit them with bombs and gunfire, but also detonated a fuel and ammunition dump, causing 100+ secondary explosions.

At Da Nang, increased MiGCAP and BARCAP sorties comprised 35 per cent of VMFA-115's October 1970 schedule, although CAS and TPQ continued unabated. While most BARCAPs meant unrelenting tedium for the crews, there was an occasional response from the VPAF. In November 1969 a VMFA-115 element was sent in hot pursuit of a suspected MiG approaching the offshore limits of North Vietnam, but the 'bogie' turned away, leaving two frustrated Phantom II crews to continue their orbits over the sea.

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The 'Red Devils" commander's F-4J-35-MC BuNo 155822 taxis in at Chu Lai on 12 April 1969. VMF(AW)-232 had become VMFA-232 when the unit converted from the F-8E to the F-4J at MCAS El Toro, prior to its assignment to MAG-15 and deployment to South Vietnam in March 1969. Chu Lai had been chosen as the site for a much needed Marine Corps base due to it being located in a sparsely inhabited area where the normally problematic purchase of land and relocation of local populations was less difficult. Although F-4 crews who had operated from Da Nang found Chu Lai far less crowded, the cambered and rather uneven runway often became slick when rain fell on its tyre-residue rubber coating (*USMC via Cdr Peter Mersky*)

NEW BIRDS

VMFA-122's replacement squadron at Da Nang on 30 August 1968 was VMFA-334 'Falcons', the first Marine Corps unit to receive the F-4J Phantom II. Its new AN/AWG-10 radar/fire-control system and APG-59 radar, although unreliable at first, offered better interception capability. A stronger main undercarriage and revised engines, coupled with improved landing and takeoff performance, made the F-4J a welcome replacement for the Marines' war-weary F-4Bs, although only four squadrons used the J-model during the Vietnam War.

The recently commissioned 'Falcons' soon showed their combat skill. On 11 September Maj H J Bond led a section that dropped ordnance beneath a 3000 ft overcast within 30 m of Marines, despite intensive small-arms fire. Four NVA prisoners were taken – probably the first PoWs credited to 'Marine Air' (a feat repeated by Capts Catanzaro and Richardson on 1 March 1969). On another September 1968 mission two F-4Js scored direct hits on a concrete bridge over Route 9 with Mk 117s.

In October Col Jim Sherman took over the 'Falcons' and led by example. He and RIO Capt Catanzaro penetrated heavy AAA and SAM coverage on 9 October to hit an NVA artillery site, knocking out the guns, their ammunition supplies and bunkers and leaving continuous secondary explosions. Maj Matoian and 1Lt O'Connor used some effective teamwork on a 31 December attack on a VC storage area when a 37 mm AAA gun opened up on the Phantom II. O'Connor made his second drop on the

Loaded with 750-lb M117 bombs and AIM-9B Sidewinders 'Bengals" F-4B-15-MC BuNo 151463 lines up for takeoff on a 1968 mission from Da Nang. The artistic addition to the markings on the tail is the ubiquitous 'Phantom' cartoon character (*Tom Idema*)

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stores while the FAC marked the gun position and Matoian destroyed it with three ordnance passes. His flight caused havoc in another storage area on a 1 January *Commando Hunt* mission when they left a massive fire and continuous secondary detonations in their wake.

Inevitably, the factory-fresh F-4Js took their share of minor knocks, and there was a spate of incidents involving Mk 77 napalm canisters hitting pylons and fuel tanks when released. Repeated VC rocket damage to revetment areas left rough surfaces and debris that was bad for tyres.

VMFA-334 suffered two losses that year. Capt M H Branum and 1Lt H W Gibbs sustained a rare double engine flameout in BuNo 155744 following a small-arms hit while making a fourth napalm pass on an enemy weapons cache on the Song Thu Bon River on 8 September. Two months later, on 1 November, Capt G S Libey and 1Lt W H Frizell suffered the ignominy of being the final US casualties of *Rolling Thunder* when BuNo 155742 took a very unlucky small-arms hit to its port outer wing locking mechanism whilst performing its second DAS rocket pass against a target near Vinh Linh. The port outer wing section duly folded vertically and control was lost. Phantom IIs had been known to have flown with both wings folded, but not this one. Libey and Frizell, on his second mission that day, ejected safely over the sea.

The 'Falcons' commenced a protracted move to Chu Lai later that same month, where, despite their F-4s being regularly sand-blasted by grit blown up by taxiing jets, the unit managed to fly missions every day in January. Jim Sherman led the final section of F-4Js to the 'Fightertown' base on 24 January, and from here VMFA-334 continued close-quarters destruction of the enemy's infrastructure of bunkers, tunnels and supplies. Eleven jets were hit by automatic fire that spring, with two more losses, but also a remarkable recovery by Col R S Rash and 1Lt J W Leist after a 0.50-cal bullet hit the starboard intake ramp, filling the rear cockpit with smoke. The rear canopy was jettisoned and Col Rash landed at Da Nang, despite utility hydraulic failure and a malfunctioning arresting hook.

Despite the best efforts of plane captain Cpl Gonsalves, the war has made its mark on the appearance of this F-4B. Exchanges of batches of Phantom IIs between US Navy and Marine Corps squadrons in Vietnam were common, and they often elicited complaints about the respective services' perceived standards of maintenance (*Peter Mersky collection*)

Rash and 1Lt Larry Richard's crew were cited for DFCs after a 21 June mission when two 'Falcon' F-4Js enabled the extraction of a 1st Marine Division reconnaissance team surrounded by a larger enemy force that had shot down a medical evacuation helicopter and wounded several Marines. The Phantom IIs made repeated attack runs beneath a 2700 ft ceiling in terrain rising to 3000 ft with visibility under one mile, dropping ordnance within 150 m of the team.

VMFA-232 'Red Devils' had completed a Da Nang tour with F-8 Crusaders in 1966 before converting to F-4J Phantom IIs in

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A pair of 'Bengals" (or 'Flying Tigers") F-4Bs heavily laden with M117 bombs prepare to taxi out onto Da Nang's sun-baked runway. WH 00 ('double nuts') was BuNo 152232, hit on its second attack run whilst in a 45-degree rocket pass on a storage dump 13 miles north of the DMZ in North Vietnam on 19 September 1968. The Phantom II apparently took small-arms fire, rolled to the right and only partially recovered before impacting the ground. Pilot Capt John Lavoo and RIO Capt Robert A Holt were unable to eject in the few seconds available to them (*Tom Idema*)

September 1967 and deploying to Chu Lai on 21 March 1969 for five months. The unit was tasked according to MAG-13's high-pressure mission schedule in I Corps and beyond, sustaining only one loss (BuNo 155809) on 25 July. Capt J C Stokes and 1Lt Devere were rescued after being hit on their first bomb run 15 miles from Chu Lai.

President Richard Nixon's general drawdown of US forces in Vietnam during 1969-70 took the squadron back to MCAS Iwakuni in September 1969, leaving VMFA-115 as the only Marine Corps F-4 unit in-theatre from September 1970 (when VMFA-314 returned to El Toro) until March 1971, when it too transferred to Iwakuni.

The other unit returning to Da Nang in 1968 was long-serving VMFA-542, which arrived from Cubi Point on 10 May for a further 22 months of combat supporting up to 20 military operations. Still flying F-4Bs, the squadron was heavily engaged in CAS/DAS missions, destroying dozens of VC bunkers, sniper 'spider holes' and, on 30 June, an SA-2 'Guideline' SAM site – gunners protecting the latter responded viciously with 150 rounds of 37 mm and 57 mm AAA. The 'Bengals' became major exponents of the Mk 4 gun pod, firing off almost 25,000 rounds that month. Many missions were still hot-pad 'scrambles', often delayed in June as the squadron had only one available aircraft starter unit.

The O-1 and O-2 FAC aircraft were supplemented from July 1968 by VMO-2's OV-10A Broncos at Da Nang. Designed as a counter-insurgency aircraft, the OV-10A carried substantial armament. Despite being underpowered, it performed the helicopter escort and light attack missions more effectively in some respects than the F-4, although its pilots were officially confined to FAC and visual reconnaissance. However, the slower OV-10As often detected targets of opportunity like enemy troops under cover, which the fast-moving Phantom IIs might miss. At debriefing, these attacks would be logged as 'target marking for F-4s'.

A shortage of parts was a perpetual problem that significantly reduced Phantom II availability, as did the time taken for even minor repairs to be affected. For example, a simple windscreen replacement usually took two days. Damage to a stabilator tip on an F-4B that had 'argued' with a revetment wall typically saw the jet grounded for three days, while bullet damage to an internal fuel cell required a week's work to rectify. An engine fire in VMFA-542's BuNo 151001 took it out of service for 27 days.

Cannibalisation of parts was the only short-term answer to the problem, but this in turn created 'hangar queen' F-4s that were out of action for weeks awaiting numerous components. On at least two occasions pilots forgot to fold their aircrafts' wings before taxiing into revetments,

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damaging the outer wing panels. Bullet damage sometimes had odd results. BuNo 150418 absorbed five rounds on 28 December 1968, one of which ignited the motor in a Sidewinder missile and fired the weapon off its wing rail. Two forward Sparrow missiles suddenly launched themselves from VMFA-542's BuNo 150639, although this was probably due to an electrical fault.

This particular aircraft also seemed to be the unit's 'bullet magnet', being damaged several times in early 1969. On 18 February a bullet penetrated the front canopy, grazed the pilot's shoulder and lodged in his parachute pack. BuNo 150639 excelled itself the following month when it suddenly fired off all four of its Sparrows, again due to electrical problems.

The terrain over which the F-4 units operated was also a powerful anti-aircraft weapon, particularly when pilots had to pull out of an attack dive in the direction of rising ground. VMFA-542's BuNo 152227 returned from a 13 February 1969 mission with substantial damage from the tree branches it had flown through while its pilot attempted to dodge ground fire on his pull-up. These collisions (two more occurred in April) usually included foreign-object damage (FOD) to engines. In March 1969 VMFA-542 technicians had to change twelve J79s, many damaged by FOD and each costing more than $40,000.

The 'Bengals" tactics continually evolved during 1969. In April, when the unit began escorting 'Playboy' TA-4F FACs, it was noticed that the aircraft were opposed by more AAA at certain times of the day. F-4 flak suppression flights were duly provided at those times. These joint missions were expanded in Operation *Big Hammer* in September, resulting in several 23 mm gun positions in the *Steel Tiger* area being destroyed by the Skyhawk/Phantom II hunter-killer teams, who invariably braved heavy AAA during their attacks. Similar missions were flown with USAF F-100F 'Misty' FACs. Capt Crouch and Lt Grimm took on a 23 mm site that fired on an F-100F, destroying it with Zunis and CBU-24 cluster bombs.

The Phantom II units also experienced considerable AAA when escorting VMCJ-1's RF-4B reconnaissance aircraft. On 19 August 1969 VMFA-542's Lt Col Robert Smith and Capt John Flanigan disappeared without trace when their F-4B (BuNo 149416) failed to join up with an RF-4B for its second photo run near Bat Lake, and they were presumed shot down. Their remains were eventually identified in 1995.

This unusual three-tank configuration on BuNo 150484 of VMFA-115 indicates a long-distance flight, possibly on return to Iwakuni from Progressive Aircraft Repair at Atsugi or for 'Project Shoehorn' updates. In March 1971 *Chevas Regal*'s assigned RIO was Lt C E Stewart (*Hideki Nagakubo via Tailhook Association*)

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BARCAP missions continued too, and the 'Bengals' flew them with the latest AIM-9D and AIM-7E-2 missiles from the end of October 1969, while Mk 20 Rockeye CBUs were increasingly used against hard targets like vehicles, bridges and storage buildings. Another innovation in November during Operation *Bright Thunder* was the introduction of night missions flown with Marine Corps A-6A Intruders, using the latters' DIANE radar system and moving target indicators to locate truck targets. These were then illuminated with flares expended by the A-6s for the VMFA-542 crews to attack.

In the spring of 1972 F-4J-29-MC BuNo 153796 was assigned to VMFA-232's squadron commander, or 'Head Devil', Lt Col J L Gregorcyk (*by kind permission of Gene Uhl*)

These joint flights developed into *Commando Bolt Assassin* missions, where single F-4Bs accompanied an A-6A on attacks, averaging six sorties per night. 'Spider' Nyland recalled that 'the A-6s had better all-weather systems, but if an A-6 had a problem the F-4 would be ready to roll in instead'. *Barrel Roll Assassin* missions saw F-4Bs providing fighter cover for A-6As performing deep penetration interdiction sorties in Laos.

VMFA-542 flew its last combat mission on 13 January 1970 before heading back to El Toro in the third increment of returning units. Once back in California the unit handed its aircraft over to VMFA-323 and deactivated following five years of almost continuous combat.

THE FINAL ROUND

The cessation of bombing and withdrawal of American ground forces did not deter North Vietnam from its long-gestated plan to occupy South Vietnam. Indeed, in March 1972 its newly-equipped and re-invigorated armies began major incursions into South Vietnam from the DMZ, Cambodia and the Central Highlands, quickly occupying the provincial capital of Quang Tri. America lacked the political will to re-commit ground troops to support the South's large, US-equipped forces, but an air campaign called Operation *Freedom Train* was initiated.

On 6 April – the day of the Nixon administration's decision to re-engage – VMFA-115 and VMFA-232 landed at Da Nang for assignment to MAG-15, operating from there while a new base at Nam Phong, in

A section of VMFA-212 F-4Js in 1972. Although the squadron only deployed briefly to Da Nang in April to June 1972, it engaged in some of the most arduous combat of the war (*via Michael France*)

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Continuing the age-old tradition of bomb graffiti, a Mk 82 Snakeye on Capt Dick Ewers' VMFA-212 'Lancers' F-4J has had 'Guess Who's Coming To Dinner?' chalked on it for the benefit of fast-reading NVA troops. The 'Lancers' were based at Da Nang with MAG-15 in 1972 (*Lt Col Dick Ewers, USMC (Ret) via Cdr Peter Mersky*)

Thailand, was made serviceable. Built for the USAF in 1967 but never used, Nam Phong consisted of a 10,000 ft runway and a large hangar, but no electrical power, fuel or adequate running water. There was, however, a plentiful supply of mud, and numerous snakes. It was an ideal challenge for the Marines. Strategically, the base was roughly equidistant from both Hanoi and Da Nang, putting them just within the range of Marine A-6s and F-4s. It was also far more secure than either Da Nang or Chu Lai.

The 'Silver Eagles' had been away from the war for only 13 months when they returned to Da Nang. Their final missions there up to 22 February 1971 had included a predominance of Seventh Fleet BARCAP or MiGCAP sorties (many of them for B-52 *Arc Lights*) over CAS for the first time, although many *Steel Tiger* flights were also required. At the resumption of hostilities the squadron's executive officer, Maj Thomas Duffy, was tragically lost on 27 April when his F-4B (BuNo 151472) collided with a VNAF O-1 Bird Dog FAC. His RIO, Capt D F Dziedic, survived by ejecting from the stricken Phantom II – the last of 23 F-4Bs lost by VMFA-115 during 33,553 combat sorties in Vietnam.

The CAS demands placed on 'Marine Air' at this time were severe, and VMFA-115 was tasked with performing most of these missions around Quang Tri, Hue, Pleiku, Kontum and Phu Cat as ARVN forces struggled to hold back the inexorable advance of NVA armour and troops. On one 11 May mission two Phantom IIs led by Capt W J Holverstott scrambled for a CAS assignment near An Loc, landed at Bien Hoa AB to refuel and rearm and then flew eight more CAS sorties from there.

Up to 16 June the squadron devastated enemy troops with almost 3000 tons of ordnance, including no fewer than 9640 Mk 82 bombs. For once crews had substantial targets in the open, including tanks,

Carrying a heavy ordnance load, VMFA-115 F-4B-14-MC BuNo 150484 takes on fuel during a summer 1972 mission. This aircraft was one of 12 F-4Bs fitted with AN/ASW-13 and AN/USC-2 data-link equipment in 1963-64 and designated F-4Gs for the US Navy, although they were re-worked as F-4Bs in 1966. This example was further converted into an F-4N in 1978, continuing in service until September 1981 (*Mule Holmberg via Tailhook Association*)

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The increased emphasis on air-to-air missions in 1971-72 was supported by the provision of AIM-7E-2 'Dogfight' Sparrow III and AIM-9G Sidewinder missiles. The former had a slightly reduced forward fin area, a shorter minimum range and improved manoeuvrability, while the upgraded Sidewinder had five times the range of the AIM-9B, a much more sensitive seeker and 'expanded acquisition mode' that enabled it to track a target from a launch in a flanking position to the target. VMFA-115's BuNo 150484 is also armed with nine Mk 82 GP bombs. These have been fitted with M904E2 fuses on the ends of M1A1 'daisy cutter' 36-inch extension tubes (*USMC*)

half-tracks, trucks and concentrated troop formations. Direction of strikes was inhibited by the arrival of hand-held SA-7 'Strela' infrared SAMs, compelling observation aircraft to fly above these weapons' 9500 ft range, and thereby reducing the FAC's detailed vision of the ground situation. 'Spider' Nyland was heavily involved in these sorties;

'NVA troops would fire rocket-propelled grenades into your run-in heading, hoping you might hit one or suck one into the air intake. SA-3 and SA-6 SAMs were impressive, but we had chaff and flares to be released by the RIO as you "jinked" out of the target area.'

VMFA-232's CO, Lt Col J L Gregorcyk, actually flew the first Marine Corps F-4 combat mission of 1972 on 9 April, and 360 more followed, with the unit completing a further 501 in May. During one sortie Capt J G Burns' crew accounted for more than 100 enemy casualties in a single mission. Ordnance employed by the unit was often a combination of Mk 20 Rockeye CBUs and Mk 82 Snakeye bombs, which proved lethal against 16 trucks, 15 artillery weapons and more than 100 bunkers in April alone. VMFA-232 crews won considerable praise from FACs for their accuracy in attacking targets in the Quang Tri area in particular.

As part of *Freedom Train*, B-52s targeted Haiphong docks, attacked fuel dumps in Hanoi and bombed airfields and hot transportation hubs in an attempt to cripple the NVA's invasion plans. Meanwhile, Marine F-4 units worked closely with FACs who had by now replaced their O-1s and O-2s with faster, better-armed OV-10As in order to make a greater contribution to CAS missions.

From 10 May *Freedom Train* expanded into Operation *Linebacker*, with North Vietnam being targeted by B-52s, more than 200 USAF tactical fighters flying from Thai bases, US Navy jets from Seventh Fleet carriers sailing in the Gulf of Tonkin and 'Marine Air' units both in South Vietnam and Thailand. Amongst the latter was Lt Col Dick Revie's F-4J-equipped VMFA-212 'Lancers' from Kaneohe Bay, which replaced the two

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VMFA-232 F-4J-35-MC BuNo 155811 was the unfortunate victim of a MiG-21 pilot's 'Atoll' missile on 26 August 1972. Its open radome reveals the bulky AN/AWG-10 interceptor radar. Early versions of this system retained analogue circuitry, but the AWG-10A was partly digital. It was the first radar system of its kind to use transistors (*by kind permission of Gene Uhl*)

VMFA-333's Capt John Cummings (left) and Maj Lee Lasseter with two MiG kills chalked up on their replacement F-4J, BuNo 155852. The kill markings were later moved to the top of the intake ramp, and were retained for a while even though one kill had been officially disallowed (*Maj Gen Paul Fratarangelo*)

Thailand-bound squadrons at Da Nang from 14 April. This unit, which had previously seen combat over Vietnam in 1965 as VMF(AW)-212, flying F-8Es from USS *Oriskany* (CVA-34), would complete 863 missions in South Vietnam and Laos during a brief two-month deployment.

Among the targets for 'Lancers" crews were SA-2 'Guideline' missile batteries being moved south near the DMZ rather than those defending Hanoi. Capt John Consolvo (on his second Da Nang tour) and CWO3 J J Castonguay were sent to attack an SA-2 convoy on 7 May. The vehicles were well defended, and their F-4J (BuNo 155576) was hit on its second pass. Capt Consolvo flew 18 miles towards Khe Sanh and ordered his RIO to eject as the hydraulic systems wound down. Castonguay was recovered, but it is thought that his pilot was captured by the Pathet Lao and possibly executed. A second F-4J (BuNo 155819) from the squadron was hit by AAA near Phu Cat on 4 June and its crew, Capt Ben Tebault and 1Lt Michael Konow, were unable to eject.

Lt Col K A McFerren led the first section of VMFA-115 F-4Bs out of Da Nang (known as 'Rocket City') on 16 June and landed 30 minutes later as the first Task Force Alpha aircraft at the primitive Nam Phong expeditionary base. The rest of the squadron was in place by the end of day, and the first of June's 306 combat missions began soon afterwards. Many of these took the form of CAS in support of ARVN forces around Hue, Kontum and Pleiku, crews destroying tanks, trucks and SA-2 missile sites.

VMFA-115 Phantom IIs often landed, refuelled and rearmed at Da Nang, before flying another mission on their return trip to Nam Phong.Some monsoon-season strikes were flown with LORAN-equipped USAF Phantom IIs, these sorties being carried out in a similar way to a TPQ drop. However, the squadron was also heavily tasked with escort missions that took crews more than 300 miles from Nam Phong.

According to 'Silver Eagles" pilot Maj De Jong, travelling such distances meant that 'VMFA-115 became the first Marine tactical fighter unit to require routine aerial refuelling on every combat mission. The significant tactical lesson learned during the month was that it is entirely feasible to air-refuel heavily laden F-4Bs at low altitude behind slow KC-130

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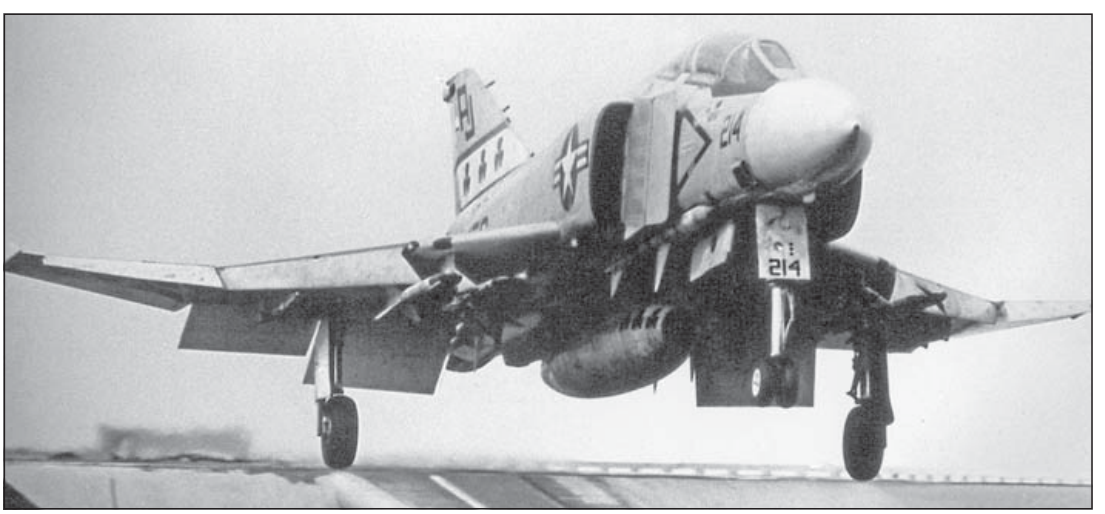
Hercules tankers'. The latter, also protected by an F-4 CAP, could be called in to prolong loiter times.

For many pilots tanking was the worst part of the mission, but the pay-off, as Col Kiely recalled, was 'a very high likelihood of MiG activity, and engagement. Most of us dreamed of encountering a MiG, but North Vietnam was, for air-to-air, a target-poor environment'. However, it was known that every MiG pilot also dreamt of shooting down a B-52, so F-4 escorts had to be ready to meet them on virtually all *Linebacker* missions. VMFA-115 increased its air-to-air training accordingly, briefing with the 432nd TRW at Udorn RTAFB and using the unit's training ranges.

Coordination with USAF units was vital in skies where they had overwhelming air superiority, for as Lt Col Maag reported, one of VMFA-115's biggest problems was 'that the Air Force was not used to seeing friendly, non-camouflaged aircraft, and they often mistook us for MiGs'. Luckily, visual identification was still a rule of engagement, but the squadron attended daily *Linebacker* briefings at Udorn to clarify mission plans nevertheless.

The usual tedium of repeated BARCAP orbits flown over the ocean from 6 September was often relieved by ACM practice on the return journey. These missions reached a welcome termination on 22 October 1972, only to recommence after the break up of the Paris peace talks in December.

VMFA-333 'Shamrocks' was carrier-based for much of its time with the F-4J, making two deployments embarked in USS *America* (CVA-66) and two aboard USS *Nimitz* (CVN-68). The 'Shamrocks' used CVW-8's 'AJ' tail modex in place of its usual MCAS Beaufort 'DN' codes. BuNo 155516 later flew with CVW-3's VF-103 aboard USS *Saratoga* (CVA-60) until it was lost in a flying accident over the Mediterranean on 23 October 1974 (*via Maj Gen Paul Fratarangelo*)



'Shamrocks" AJ 214 departs CVA-66's waist catapult two configured for air-to-air combat. The squadron shared fighter duties with CVW-8's F-4J-equipped VF-74, but VMFA-333 scored the only MiG kill of the 1972-73 combat cruise (*via Maj Gen Paul Fratarangelo*)

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These 'Shamrocks' pilots and RIOs each completed more than 200 'traps' on *America* during the 1972-73 deployment. Unit commander, Maj Lee 'Bear' Lasseter, is seen standing at far left, while his RIO, Capt 'Lil' John' Cummings is crouching (right). Then Maj Paul Fratarangelo, who flew 485 combat missions with all four Marine Corps aircraft wings, is standing fifth from the left (*Maj Gen Paul Fratarangelo*)

The 'Red Devils' shared these primary escort duties with VMFA-115, although poor weather often kept the B-52s on the ground. Indeed, *Linebacker* missions were scrubbed for half of July and August. This meant quickly downloading the AIM-9 missiles and replacing them with TERs loaded with ordnance for CAS/DAS instead. The favoured load at the time was four Mk 20 Rockeye CBUs, four Zunis with anti-personnel heads and two Mk 82 'daisy cutter' bombs. Zunis were often fired during a flak-suppression dive, followed up with Mk 82s or CBUs. During the various 'bombing pauses' in December 1972 the squadron mounted up to 16 air-strikes daily, resuming BARCAPs from 16 December.

One operational improvement arose from the re-scheduling of times on BARCAP station so that the F-4Js did not have to carry bulky 600-gallon centreline fuel tanks – US Navy and Marine Corps Phantom IIs rarely used them. If a 'Marine Air' jet was configured with such a tank it would have to be de-fuelled so as to keep the aircraft within allowable gross weights if ordnance was to be carried. The tanks also impeded the F-4's speed and handling on BARCAP sorties, which by September comprised almost half of VMFA-232's duties.

And it was on a 26 August BARCAP that the squadron had its only MiG encounter. 1Lts Sam Cordova and D Borders were crewing the No 2 F-4J (BuNo 155811) in 'Motion Alpha' section when it was vectored onto a VPAF 927th Fighter Regiment MiG-21 flight by a *Red Crown* controller. The final outcome of this rare encounter was far from victorious, as Col Denis Kiely, who led the formal investigation into the action, explained;

'He took an "Atoll" missile [probably from Nguyen Duc Soat's MiG-21] up the right engine and the crew ejected in a ball of fire. The RIO [Borders] was rescued but Cordova was killed [presumably by enemy troops] during the recovery. The fault lay totally with the section leader. Poor pre-combat training of the wingman, who had almost no ACM training, was also a contributing factor, along with unreliability of the AWG-10 weapon system.

'The flight leader retained tactical lead even though his radar was inoperative, failed to keep his wingman informed as to his intentions and failed to aggressively prosecute the intercept. He was flying at 310 knots at 26,000 ft, and the F-4 was a poor performer above 20,000 ft and certainly at a disadvantage at engagement speeds below 500 knots. He failed to jettison his three external tanks – a "must" if one was going to

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Parked outside the 'Red Devils" hangar at Nam Phong on 12 October 1972, F-4J-32-MC BuNo 153882 has its in-flight refuelling probe extended for maintenance. Note also the Sidewinder launch rails on the LAU-7 pylons (*SSgt Dub Allen via Peter B Mersky*)

engage. Then, having failed to obtain visual contact with the MiGs, and being informed of a "merged plot" by *Red Crown*, rather than go into full afterburner and "blow through" to set up for another intercept, he started a turn which made him and his wingman easy targets.'

Marine honour was restored 16 days later by Maj Lee 'Bear' Lasseter and Capt 'Lil' John' Cummings. Both were very experienced aviators serving with VMFA-333 'Shamrocks', which was assigned to Carrier Air Wing 8 aboard USS *America* (CVA-66). The only Marine F-4 squadron to embark on a US Navy carrier during the Vietnam War, the unit had commenced combat operations on 14 July 1972. Initially flying CAP and strike missions in Route Packages III and IV, VMFA-333 had been committed to the US Navy's 'hot' Route Package VIB by September. Targets in this area included the heavily defended areas around Haiphong.

Thanks largely to the expertise of veteran RIO John Cummings, the AWG-10 radars fitted in the unit's F-4Js were among the most reliable anywhere. His pilot, 'Bear' Lasseter, had been a leading figure in the Marine Aviation Weapons and Tactics Squadron, which developed and taught Topgun-style ACM tactics. Following Lasseter's training, 'Shamrocks' crews were highly proficient in air-to-air combat.

Their 11 September mission was a MiGCAP orbit north of Haiphong from which they were vectored onto MiGs circling Phuc Yen airfield. Capt Cummings picked them up on radar at 19 miles, despite the VPAF jets being at low altitude, and the 'Shamrocks" wingman, Capt Scotty Dudley, saw the leading silver MiG-21 at six miles. Lasseter launched two AIM-7E-2 Sparrows, but the MiG pilot evaded both weapons. A turning fight then developed immediately over Phuc Yen, with copious AAA fired at the Phantom IIs. 'Bear' loosed off his other two Sparrows and two AIM-9Ds, but the MiG pilot kept up his low-altitude evasion.

Dudley soon had to break away with fuel starvation, as his jet had only received a partial in-flight 'plug' earlier in the mission. The MiG pilot chose that moment to reverse his turn, possibly assuming that Lasseter's

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Complete with a 'Snoopy' addition to its intake ramp, F-4J-35-MC BuNo 155822, assigned to 'Head Devil' Lt Col Robert E Solliday, is seen on final approach to Iwakuni in 1972. The F-4's vertical tail, designed to be long and low in order to fit into the hangar deck of aircraft carriers, made an ideal 'billboard' for squadron insignia (*by kind permission of Susumu Tokunaga*)

Phantom II (BuNo 155526) was out of missiles. However, 'Bear' still had two Sidewinders left, and he fired one of them. As John Cummings told the author, 'The growl of the Sidewinder tone was loud enough to drive you from the cockpit, and it really did a job on that MiG. Everything aft of the cockpit was gone'.

Maj Lasseter then saw a black MiG-21 threatening Dudley's departing Phantom II, and he warned his wingman to 'break' before firing his remaining Sidewinder, which also guided successfully. They saw the MiG diving away, trailing smoke, but then had to concentrate on urgent SAM warnings and a chronic shortage of fuel that compelled them to egress directly over Hanoi city. Moments later an SA-2 exploded near their right wing, and Lasseter regained control long enough for them to reach a safe over-water ejection, albeit at up to -6g. Dudley's F-4J (BuNo 154784) was hit by AAA minutes later, and its remaining fuel gushed out. However, he and his RIO, 1Lt J W Brady, also made it 'feet wet' over the ocean and eventually joined Lasseter and Cummings back aboard CVA-66 to celebrate the only all-Marines MiG kill, and another 'damaged'.

After the furious onslaught of *Linebacker II's* B-52 raids on Hanoi and Haiphong, and the eventual ceasefire on 27 January 1973, there was a rapid withdrawal of US military assets from the war zone. The conflict was not over for the Thailand-based Marine units, however, with operations over Laos and Cambodia continuing until December 1975 for some USAF squadrons.

The war finished for VMFA-115 and VMFA-232 on 31 August 1973. The 'Red Devils" missions that year had almost all been air-to-ground, concentrating on targets in Quang Tri Province. Indeed, it was here that 'Motion 2' section, including Capts Luhmann, Campbell and Church, with 1Lt Poling, dropped the final MAG-15 bombs on the area on 27 January 1973. Their FAC was 1Lt Poling's brother, who commended the Phantom II crews on their accuracy in the face of heavy 85 mm AAA. The squadron also took part in a day of strikes in Cambodia on 25 February, but the Laotian ceasefire ended missions there at 1200 hrs on 22 February.

For VMFA-115, it was the unit's 33,553rd combat sortie (a total that included *Steel Tiger/Barrel Roll* flights) in February that saved Saravane, in Laos, from falling to NVA attacks. A short while later a flight led by VMFA-232 CO, Lt Col R O Lawrence, dropped the Marine Corps' last bombs on Laos, and crews then sped to Udorn for the USAF's raucous 'End of War Happy Hour' celebrations.

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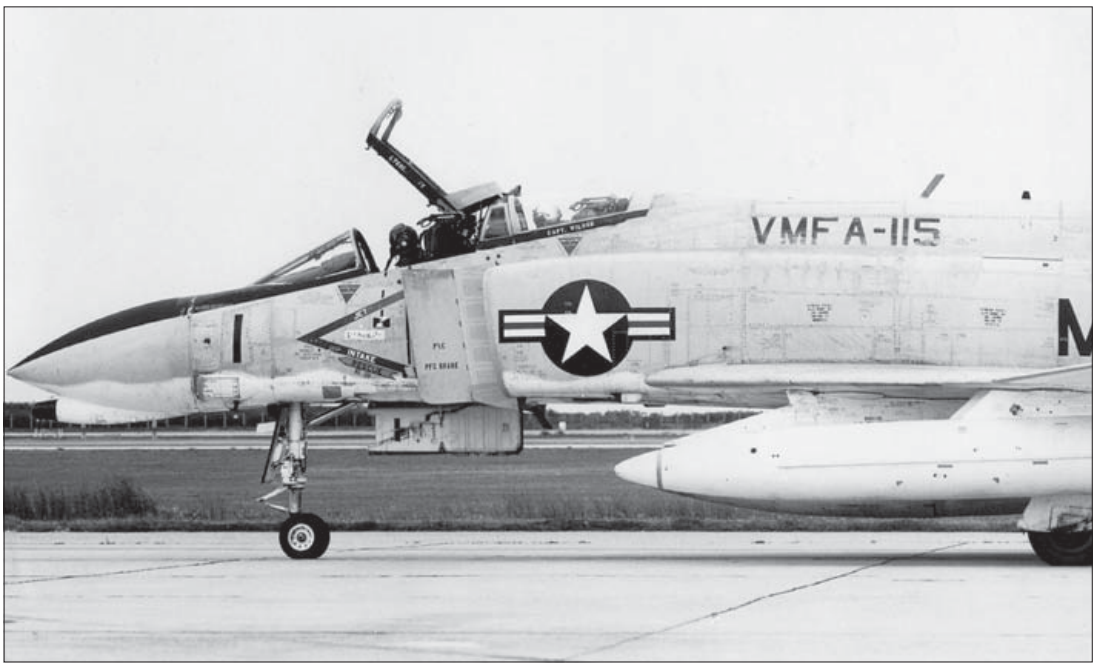

This F-4B was assigned to Lt Col H C Ivy, commander of VMFA-115 at Nam Phong from 23 July 1972 until the end of hostilities in 1973. The deep mud and primitive conditions of the bare base facilities at Nam Phong (officially Nam Phuong) earned it the nickname 'The Rose Garden', inspired by the Marine Corps recruiting slogan 'We don't promise you a rose garden' (*Author's collection*)

On 30 March the deteriorating situation in Cambodia took Lt Col Lawrence's division on an 850-mile flight to a target where the F-4s left 30 enemy dead. From January to June this total rose to 850 KBA in around 200 combat sorties per month for VMFA-232, while VMFA-115's total was more than 350 KBA, along with a long list of destroyed AAA sites, trucks, bulldozers, bridges and gun-pits.

Throughout this period the 'Silver Eagles' continued to train for ACM, priding themselves with 100 per cent 'full systems' operations with the F-4B's AWG-10 radars against simulated Soviet threats. The radar was, in any case, the best way to navigate around the frequent monsoon storms that rolled through Southeast Asia. Numerous ACM sorties were also flown, with VMFA-115 routinely flying against the newly delivered 432nd TRW's slatted F-4E Phantom IIs from Udorn RTAFB. The 'Silver Eagles' generally flew six combat sorties and six training flights each day. In their spare moments, unit personnel continued to improve the bare-base facilities at Nam Phong, known ironically as 'The Rose Garden' but described by an occupant as a 'godforsaken, forlorn area, knee-deep in mud'.

Hostilities in Cambodia eventually ceased on 15 August, by which time VMFA-115 had passed its 34,000 mission total. The unit's achievement was summed up by a 'Nail' FAC pilot who had tallied more than 600 combat hours working with the Nam Phong squadrons;

'We've dodged SA-7s, SA-2s and triple-everything. Due to your work, we did the American advisors and "friendlies" some good, put the hurts on the bastards and got a lot of honest BDA. You've always done your part with excellence, professionalism and "Sierra Hotel" teamwork. Whenever I needed bombers I called "Cricket" or "Hillsboro" [ABCCC controllers] for [USAF] air strikes. Whenever I needed surgeons, it was "Goddamit, send me 'Motion' or 'Blade' now!" You are the best in the world.'

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GOLDEN HAWK EYES

McDonnell had sold reconnaissance versions of its F2H Banshee and F-101 Voodoo, so a 'recce' Phantom II was a natural development, particularly as Secretary of Defense Robert McNamara's goal was 'commonality' of designs to save money. This lay behind the purchase of Phantom IIs by all three US services and the sharing of the RF-4 project between the USAF and the Marine Corps. The US Navy had its own RA-5C Vigilante and RF-8A Crusader reconnaissance aircraft, and showed little interest in McDonnell's F3H 'Model 98F' camera-nosed proposals during the Phantom II's conception. However, the USAF favoured an F-4B adaptation, which was designated the RF-110A in June 1962. Its subsequent decision to buy the F-4C eased the way for production of a reconnaissance version, the McDonnell RF-4C beating the rival Republic RF-105 and Douglas RA-3C.

The aircraft's advanced equipment included a Litton inertial navigation system (INS), AN/AAS-18 long-wave infrared (IR) imaging, external electronic intelligence capability and a stereo TV camera viewfinder. Two prototypes were constructed, and the first one, modified from a stock F-4B, flew on 8 August 1963. The aircraft's extended nose took the RF-4C's overall length from 58 ft 2 ins to 62 ft 9 ins, the extra space housing cameras and a specially-developed Texas Instruments AN/APQ-99 lightweight multi-mode radar with radar mapping, terrain following capability and a smaller radar dish than that fitted in the F-4B/C. The addition of AN/ALQ-102 sideways-looking airborne radar (SLAR) and a cassette jettison system to deliver photo data by parachute made the RF-4C the world's most sophisticated tactical reconnaissance aircraft.

The Marine Corps showed great interest from the outset, but it was not able to commit to a purchase until February 1963, when 12 F4H-1P (RF-4B) Phantom IIs were ordered. They closely resembled the RF-4C, but retained the F-4B's thinner main undercarriage wheels, probe refuelling system and flight controls in the front cockpit only. A telescopic boarding ladder was added and, like the RF-4C, the AIM-7 missile wells and systems were deleted. The aircraft's performance was similar to the F-4B's, although its longer nose slightly reduced longitudinal stability.

The prototype RF-4B (BuNo 151975) first flew on 12 March 1965, and seven months later aircraft entered service with Marine Composite Squadron (VMCJ) 3 at El Toro. VMCJ-2 at Cherry Point was also re-equipped, and both

RF-4B-21-MC BuNo 151978 (the fourth production reconnaissance Phantom II) demonstrates the aircraft's tapered 'box' structure under the nose that housed the cameras, the faired-over missile wells and smaller radome – features seen on all 'recce' RF-4s. The light-coloured area near the front of the vertical stabiliser was the ARC-105 HF antenna (*via Marty Lachow*)

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squadrons handed their RF-8A Crusaders back to the US Navy. It was already clear that the expanding war in Vietnam would require Iwakuni-based VMCJ-1 to update its reconnaissance assets too. The squadron had previously used 'photo-recce' versions of the F7F Tigercat and F2H Banshee, before receiving RF-8A Crusaders. It took five EF-10B Skyknights to Da Nang on 16 April 1965, with the carrier-borne RF-8A component following in December.

BuNo 153105 was in the first batch of nine RF-4Bs to arrive at Da Nang on 28 October 1966, and it remained with VMCJ-1 until September 1975. Transferred to VMFP-3, the jet saw service until July 1989, by which time it had completed 5500 flying hours. It is seen here parked next to a VMCJ-1 EF-10B 'Whale' ECM aircraft, which, like the RF-4B, was a scarce but invaluable asset during the war (*USMC*)

During the summer of 1966 VMCJ-3 received ten new RF-4Bs, and it prepared both them and their crews to deploy as an element of VMCJ-1. Despite early problems with the camera installation, nine aircraft deployed to Da Nang on 28 October 1966 to find their ES-40A Photographic Processing Units already in place at the crowded base. The RF-4B was an immediate success with its crews as Col Ed 'Alligator' Love, who assumed command of the squadron in May 1967, told the author;

'The pilots loved the RF-4B! The cockpit fitted like a glove, and all the controls and switches were where you expected them to be. You added throttle and there was an immediate burst of power. Responses from the other controls were equally as satisfying.'

Traditionally, VMCJ-1 expected its crews to cross-train in two or more of the aircraft types it operated. This became more urgent in 1965, as the demand for F-4 back-seaters had absorbed most of the experienced EF-10B radar operators. As a quick fix to the problem, a group of sergeants, including Jerry O'Brien, were hastily trained in the RF-4B's complex systems at McDonnell's St Louis headquarters. 'Aerodynamics and navigation were mentioned', he remembered, 'hydraulic systems were analysed, camera systems were explained, including the new and exciting IR and SLR systems. Then they got into the INS'.

Maj (later Gen) John R Dailey was an experienced Marine A-4 Skyhawk and F-8 Crusader pilot at the time;

'I got combat qualified in the F-8 and I was going to deploy to Vietnam. I made major, but the quotas changed and they didn't need an F-8 major. They did need an RF-4 and EF-10B major. My orders sent me to VMCJ-1 as a replacement pilot. I talked to Bill Tomlinson, the commander of VMCJ-3. I said I was going to VMCJ-1 and had no F-4 experience. He told me the orders were actually to fly the EF-10B. He told me to get 50 hours in the Skyknight and then we would talk about the RF-4. I soon qualified on the RF-4B and accumulated 300 missions in both it and the EF-10B in one year. I usually flew two RF-4 hops during the day and one EF-10 hop at night.'

Nocturnal missions often took the Skyknight crews into North Vietnam to provide ECM cover against 'Firecan', 'Knife Rest' and other North Vietnamese radars for USAF *Rolling Thunder* strikes. Da Nang's EF-10Bs continued to offer valuable jamming support until 25 October 1969, when the last two left to join VMCJ-3.

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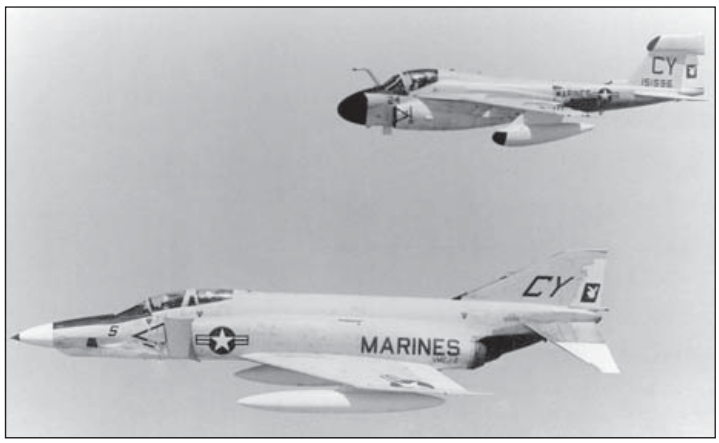
VMCJ-1 (or 'J-1' to its members) also took on four Grumman EA-6A Intruder electronic warfare aircraft at the same time as the RF-4Bs, making it, for a while, the only 'Marine Air' unit to operate four different types. Intruder crews worked closely with the Phantom IIs in the search for NVA fire-control radars, particularly in the A Shau Valley. Once the EA-6As had plotted the source of radar emissions as exactly as they could, an RF-4B would be tasked to photograph the site for attack by strike aircraft.



The 'eyes and ears of the Corps'. RF-4B-25-MC BuNo 153098 holds formation in 1968 with a squadron EA-6A, a crucial EW platform in the Vietnam War. VMCJ-2 'Playboys' was the east coast composite squadron tasked with training new aircrew in Southeast Asian tactics. It sent 18 pilots and RIOs to VMCJ-1 in 1971 alone (*USMC*)

'At first no-one was quite sure what to do with the EA-6As, but we did launch nine-plane missions to support *Linebacker I* and *II* [1971-72] strikes with EW', recalled Gen Dailey. 'It turned out that our jets were the only ones capable of jamming the I-Band frequency used by North Vietnamese fire-control radar sites. Nobody else had anticipated that requirement. They really wanted us up there'.

The Intruders also freed RF-4Bs from having to carry an AN/ALQ-81 ECM pod on one of the aircraft's inboard pylons. In areas where AAA was known to be intense, RF-4Bs were sometimes escorted by a Marine F-4B loaded with Zuni rockets and Rockeye CBUs. The F-4B pilot flew above and behind the 'recce bird', weaving from side to side and looking for evidence of ground defences. The extra manoeuvring and the drag of its weapons load often meant that the F-4B exhausted its fuel reserves long before the sleeker RF-4B flying straight and level.

By the end of November 1966 the Phantom IIs had taken over the bulk of VMCJ-1's reconnaissance missions from the unit's RF-8As, which flew their last combat mission with the squadron on 3 December. Initial problems with the RF-4s' sophisticated electronics delayed the handover date by several weeks. The Crusaders' photographic input was missed, as Gen Dailey explained. 'Our people said they liked the RF-8's product because they didn't have to enlarge it, but the RF-4's negatives had to be blown up at least once, and we began losing resolution – sometimes as much as 50 per cent'.

The Phantom IIs had also been moved into a new hangar in time to avoid serious damage from VC 140 mm rocket attacks on 27 February 1967. The CO of the 'Golden Hawks', Lt Col W B Fleming, was pleased to note that squadron personnel had woken up and manned their defensive perimeter positions within 50 seconds of the first rocket landing that night. Enemy rockets could be fired from up to ten miles away, and RF-4 imagery sometimes showed white streaks that indicated the weapons being fired.

In March the squadron flew 130 RF-4B sorties (each one up to 2.5 hours long) in support of 1st MAW air operations, and this tally rose to 176 sorties for 15 different Marine Corps operations in April, resulting in 131,662 ft of film being exposed. Usually six missions a day were launched, each with a pair of Phantom IIs, from 0630 hrs onwards until 2000 hrs, although occasionally two early 0300 hrs missions were needed too.

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BuNo 153102, with 14 combat missions on its 'scoreboard' and evidence of some hard usage, rolls down the Da Nang runway. 1Lt Frost and Capt J Stewart attempted a MOREST landing in this Phantom II on 13 June 1970 without a brake parachute, but the cable snapped and the pilot blew both main-wheel tyres trying to stop, eventually engaging the BAK-12 arresting gear. Further damage was caused when a crane dented the aircraft's SLAR panels while lifting it from the runway (*USMC*)

Despite having as few as five RF-4Bs on the line, VMCJ-1 generated vast quantities of data each day for the intel processors ('interps'), sometimes overwhelming their facilities. The 'interps' were still geared to handling monochrome photographs, mostly generated by the aircraft's high-altitude panoramic cameras and later from KS-87 mosaic coverage at 5000 ft. This meant that the data collected by the RF-4's other systems was seldom used at this stage in the conflict.

'Film was the cheapest thing we had. The ability to exploit it was the problem', recalled Gen Dailey. Whilst working for Brig Gen Tom Marsh, Dailey helped create an automatic interpretation station using the cameras' automatic data annotation system (ADAS). 'Each frame of film had blocks that gave the latitude, longitude, altitude and attitude of the airplane. You could calculate the coverage of a photograph when ADAS was working properly, but it was a rather unreliable system'.

The RF-4B's cameras were housed in three bays in the extended nose, and they included, as Jerry O'Brien explained, 'a forward-looking camera [Chicago Aerial Industries KA-87] in Station 1 that could be rotated to the vertical position. There was a low-altitude, horizon-to-horizon scanning camera [Fairchild KA-56] in Station 2 that could operate at 250 ft and 600 knots. The third camera bay [Station 3] contained a KA-55A high-altitude panoramic vertical or two KS-87 split-vertical cameras, while Station 2 could hold either a left and right oblique pair of KS-87s looking through the side windows or a tri-camera array of KS-87s. The high-altitude panoramic KA-55A came into use in December 1969, but it was weather-limited since its shooting altitude was 9000 ft.

'The large slab SLAR antennas were in two cheek fairings behind the camera bay, while the AN/AAS-18 IR set was mounted in the lower fuselage between the intake splitter plates. Missions were briefed as "photo", "IR" or (least frequently) "SLAR", and the terrain-following mode of the radar required the jet to be flown at a minimum speed of Mach 0.93. If the pilot ignored this provision there was a likelihood that the aircraft would impact a hill-top. Obviously the speed was a function of the attitude of the jet, the latter having to be slightly nose-down in trim in order for the terrain-following radar to work properly.

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'The forward radar beam in this mode of operation was also very narrow. Thus, you could fly down a very narrow valley feeling perfectly safe, never knowing that the hillsides were crowding in on you. Theoretically, you could plug the terrain-following radar into the autopilot, but I never knew anyone dumb enough to try it. I have often been surprised by random inputs into the autopilot at low altitude that caused the aircraft to dive abruptly.'

It is likely that the loss of Maj Richard Hawthorne and Capt Richard Kane in BuNo 153104 'Cottonpicker 5' during an IR mission over the South Vietnam-Laos border in the early hours of 11 September 1967 may have been caused by these radar guidance problems. Col Ed Love recalled that another crew in the area had seen a bright flash at the top of high terrain. 'We suspected that the pilot may have turned in towards a mountain in a 30-degree bank and the terrain was out of the radar's field-of-view until it was too late for the pilot to react'.

Jerry O'Brien had reminded Capt Kane of the Mach 0.93 lower speed limit for terrain following at the briefing. 'We could go up a narrow valley at a fixed altitude, but we couldn't expect to repeatedly go over ridgelines, drop down into valleys and then go up over the next ridge. The radar, not seeing the bottom of the next valley, would give you a "dive" command as you topped the first ridge. Then it would sense the valley floor and give you a "climb" command. The narrower the valley, the more violent the commands. This could start off a vertical oscillation that grew increasingly violent until the wing structures failed due to g-loads. To fly these missions at any speed below Mach 0.93 would cause the aircraft to clip the tops of hills. I don't think Hawthorne knew this'.

One of the earliest uses of the RF-4B was to provide 'mosaic' photo coverage of the DMZ, which contained extensive North Vietnamese

Protected from VC rocket attacks at Da Nang by its 'wonder arch' shelter, BuNo 153091 survived 23 years with four Marine Corps reconnaissance units before retirement in August 1989. The RF-4B's reconnaissance systems proved to be very reliable, although the intensity of operations inevitably yielded minor difficulties. In June 1970 – a fairly typical month towards the end of VMCJ-1's combat tour – the squadron completed 751 of its assigned photographic targets, losing 11 to camera shutter problems, 16 to magazine malfunction and five to over-thin film. The high-g manoeuvres required for terrain or AAA avoidance could damage the focal plane shutters in the cameras. As usual, the weather accounted for the majority (65) of targets 'not completed' that month. Maintaining the aircraft's complex IR and SLAR sensors was a demanding process, and the recruiting pipeline sometimes had difficulty in producing enough qualified technicians (*USMC*)

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At the end of another mission BuNo 153107's crew stream the brake 'chute and look forward to a cool beer. One of the first RF-4Bs to arrive at Da Nang, this aircraft gave the Marines 23 years of virtually faultless service while accumulating more than 5500 flight hours (*USMC/ Tailhook Association*)

weaponry. Normally this was done by a single aircraft flying a series of parallel and highly predictable tracks, giving enemy gunners plenty of time to set their sights. VMCJ-1 RIO Marty Lachow devised a way of reducing risks and maximising coverage by simultaneously flying five parallel tracks;

'I set up a plan using five aircraft in V-formation. We each had a radar operator set up a radar position on the other aircraft, with Lt Col Fleming and myself in the lead. The formation took up position some 60 miles out to sea at 40,000 ft and headed in, descending, "balls out". Fleming and I centred on the DMZ [descending to 500 ft]. Suffice it to say that one pass was successful, and in all probability both our "grunts" and the NVA troops on either side of the DMZ lost their hearing from the sonic booms of five Phantom IIs overhead at just 200 ft.'

On other occasions coverage had to be by single aircraft flying parallel tracks up to 20 times in the same area to provide wide coverage of bomb damage or suspected enemy troop movements. Generally, unlike F-4B/J tactics, the 'one pass, haul ass' rule applied to VMCJ-1, with no multiple passes permitted.

Updates to the RF-4B's myriad systems continued, with the first jet flying to NAS Atsugi in May 1967 for 'Shoehorn Delta' ECM installation, and the rest making the trip at ten-day intervals for the six-day modification process, or receiving the upgrade in the field. Conditions for the crews on base were less hi-tech, however, with officers paying $20 each for the installation of rudimentary air-conditioning devices in their stiflingly hot tented quarters. Monsoon conditions of high humidity, fog and heat caused J79 engine compressors to stall, melted the potting compound that insulated electrical connections and made fuel tanks leak.

New tasks were introduced, including sorties with VMA(AW)-242 A-6A Intruders to photograph the results of their bombing. John Dailey flew some of those missions;

'When the A-6As arrived around November 1967, we wanted to see if they were hitting their targets. We planned to have an RF-4 fly wing on an A-6 during its bomb run. We got the pictures and we could see that the Intruders were *not* hitting the target. Everyone was naturally upset, and they wanted to keep doing it until they had a picture of an A-6 hitting

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its target. They'd drop bombs and break off, leaving us in the RF-4s to follow, and we were getting shot up pretty badly. On my third mission with an A-6 I got really blasted at Vinh, where VMA(AW)-242 was bombing a bridge.

'During the next mission brief I asked the A-6 crew, "What's your climb-out speed?" "Ah, about 300", they replied! I had three tanks on the RF-4 for a night rendezvous with a dissimilar aircraft. He was doing about 250 knots. We could fly at 550 knots with the three tanks, and often exceeded 600 knots in this configuration.'

With up to ten sorties per day, VMCJ-1's data production soared, and in August 1967 the one-millionth photo print was processed. During Operation *Grand Slam* three months later, a division of four RF-4Bs made repeated photo runs over artillery positions near the DMZ, resulting in the creation of more than 3800 photo negatives. Each had two sets of prints and two sets of duplicate negatives and prints, and all were available for analysis and target planning within 13 hours of the flight. 'When we made a pass we turned everything on', Gen Dailey noted.

Inevitably, such frequent exposure to enemy fire caused damage to the low-flying Phantom IIs. In their first year three returned with small-arms hits. BuNo 153106 suffered most, suffering combat damage on four separate occasions in 1967. The fourth encounter on a 3 September mission left it with a dozen holes in its wing and lower fuselage from 37 mm hits. Repaired, the jet returned to the fray and took two more serious hits in 1970, one of which caused an engine fire. The RF-4B eventually completed 5500 hours of flight time before being retired in May 1989.

An unlucky shot at BuNo 153091 in March 1970 went straight through one of its KS-87A cameras. However, the second RF-4B loss was caused by a landing accident. Maj D 'Eski' Escalera tried to engage Da Nang's M-21 MOREST arresting cable on Christmas Day 1967, but the aircraft was travelling at more than 150 knots – faster than the MOREST setting. The cable snapped and hit the Phantom II's tail, forcing it into the 'maximum climb' position and pitching the aircraft's nose up steeply. Maj Escalera selected afterburner in an attempt to climb to a safe altitude, but the 60-degree angle was far too sharp and the stalled RF-4B (BuNo 153114, 'Pigment 57', received from VMCJ-3 on 16 July 1967) fell back to earth.

The pilot made a split-second ejection but the seat was set too high for 'new guy' RIO 1Lt Tom Grud to easily reach the primary overhead ejection pull-handles, so he had to grab the secondary ejection handles instead. He ejected at 200 ft with the aircraft at 20 degrees past the vertical, and he struck the ground and was killed before his parachute had deployed. 'It was that close', Jerry O'Brien remembered. 'A matter of a fraction of a second was the difference between life and death'.

The most dramatic arrested recovery was probably that of BuNo 153103/RM 17 on 17 September 1968, with 1Lt Roger Erickson at the controls. Extensive AAA damage had knocked out the Phantom II's utility hydraulic system, resulting in the starboard main gear 'hanging up'. The aircraft 'took the wire' on a foamed runway, but the starboard wing-tank burst, causing a fire that extensively scorched the side of the Phantom II. It had to be shipped back to NAS North Island, California, for major repairs, but it returned to service with VMCJ-3 in May 1970.

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BuNo 153093/RM 15's 'Shoehorn' ECM antennas are clearly visible beside the forward oblique framing camera window, just to the rear of the radome. The associated radar warning receiver equipment was 'shoe-horned' into VMCJ-1's RF-4Bs from 20 May 1967 at the Fleet Air Western Pacific Repair Facility (FAWPRA) at NAS Atsugi, Japan. Panoramic camera windows are just ahead of the Modex '15' digits and the SLAR antennas are in long cheek fairings below the 'jet intake warning' triangle. Like other Marine Corps Phantom IIs, the RF-4Bs were progressively re-equipped with Martin-Baker Mk H7 ejection seats from 1967 onwards (*USMC*)

Small-arms damage was usually superficial, although it could take several days to repair. 'We took lots of hits in the RF-4 – mostly small-arms fire and an occasional 23 mm. The F-4 and J79 engines were very strong and could take a lot of punishment', Gen Dailey recalled. Col Love echoed this, stating that 'the flight limits of the aircraft were constantly exceeded, especially in the areas where AAA or SAMs were encountered. We had nose radomes blown off [BuNo 153101], external fuel tanks blown apart and took numerous hits from small-arms fire without loss of lives or aircraft. The RF-4Bs were a dream come true, and we flew the hell out of them'.

At the end of 1967 the majority of the sorties being flown by VMCJ-1 called for photographic coverage of enemy positions. In January 1968 the unit was tasked with monitoring the massive NVA infiltration along roads in the A Shau Valley. These flights were the daytime priority for several months, Phantom II crews flying high-speed, low-altitude missions that saw them taking ground fire from below, and from the hills above the aircraft.

RF-4 imagery in January, including night IR footage, revealed seven new gun positions and a road in the A Shau Valley, while enemy bivouac areas were discovered in the area surrounding the Marine Corps stronghold at Khe Sanh. One mission to Con Thien on 22 January enabled analysts to identify nine light artillery sites, 151 light AAA positions, 18 57 mm AAA positions and storage bunkers for future attack. February missions showed up 155 'hot' IR emissions, many of them vehicles on the trails routes or cooking fires. Lt Col E B Parker, the CO of VMCJ-1 in

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April 1968, reported that the RF-4B's 'IR sensor, coupled with the hot readout capability, enables the gathering within minutes of intel data on the enemy when he is most secure in his environment'.

Although poor weather cancelled three-quarters of the night missions that month, the value of IR imagery was increasingly appreciated. As Gen Dailey recalled, 'In 1967-68 we flew IR missions almost every night. One problem we had with shooting the IR was that there was no cover for the IR sensor on the aircraft like the glass for the camera lens ports. We just opened a door in the belly so that the sensor wouldn't be filtered, but we needed to get it closed in a hurry when flying through rain, or it really messed things up. We were still learning how best to use IR and SLAR'.

The squadron's intensive flying probably made it the only Marine unit to fly every day around the clock with no breaks, apart from weather 'aborts'. Col Dayton Robinson Jr 'really detested night IR missions at very low altitude. They were extremely dangerous, difficult flights, and results in South Vietnam were so negligible as to be a useless high risk'.

A third RF-4B (BuNo 153115) was lost during a Khe Sanh mission on 2 March 1968, but once again enemy activity may not have been a direct cause. Maj Richard J Morley and Capt Danny C Richards experienced control problems but managed to use rudder-based manoeuvring to go 'feet wet' over the coast for a safe ejection from a position just inland. The empty Phantom II cruised on for another 100 miles before hitting the ground somewhere in North Vietnam.

On another mission Maj Morley's RF-4B had returned with what Ed Love described as 'a hole in his right wing near the fuselage big enough for a man to stand up in'. Gen Dailey remembered 'I was flying the same mission. He got the airplane back okay because the main spar was still intact. I talked to the engineers at Wright-Patterson AFB who were tracking all aircraft hits in Vietnam, and they told me there was no record of an F-4 surviving a 57 mm or larger hit. I told them about Morley and they said it sounded like a 57 mm shell, but they were sceptical about it'.

Undaunted, VMCJ-1 provided the commanders of Operation *Thor* (a seven-day joint operation conducted from 1 July 1968 by the US Army, US Navy, USAF and Marine Corps against NVA artillery, rocket and air defensive positions in the eastern end of the DMZ) with complete photographic coverage of enemy artillery positions north of the DMZ, requiring the processing of 241,130 negatives. Just weeks prior to *Thor* VMCJ-1's photo labs had been enhanced by the arrival of a colour processing unit, although as Gen Dailey explained, this was actually rarely used at first;

'I believe the lab stood idle for a while because we couldn't get clearance to dispose of chemical waste. It sounds crazy in a war zone, but it would be consistent with some of the other restrictions placed upon us. Colour processing, which uses a great deal of water, was not necessary for most intelligence gathering.'

Even the monochrome processing for April 1970 required 82,060 gallons of water for 193,730 ft of film.

The November 1968 'bombing halt' over North Vietnam reduced I Corps' photographic requirements, and RF-4B missions changed to include daily coverage of the DMZ and the southern borders of North Vietnam and Laos. These sorties exposed the aircraft to the possibility of

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RF-4B BuNo 153109/RM 22, with the additional 'Golden Hawks' insignia adopted after the unit's reassignment to MAG-15 in July 1970, approaches the Iwakuni runway. The jet is carrying two Sanders AN/ALQ-81 S/C-band track-breaker ECM pods on its inboard pylons (*by kind permission of Susumu Tokunaga*)

MiG interception, as VPAF fighters were now operating from an increasing number of forward airstrips in southern North Vietnam. This threat revived the general desire expressed by RF-4B crews to give their jets some token self-defence, as well as F-4B/J escorts. Two enterprising maintenance chiefs wired up an RF-4B for AIM-9 Sidewinders to show that it was technically possible, but the general view from Headquarters was that arming the aircraft would bring out the fighter pilots' natural MiG-killer instincts and distract them from their proper task. Permission was never granted, right up to the end of the RF-4B's Marine Corps career in August 1990.

The RF-4B's cameras were its main asset from the 'intel' authorities' viewpoint, but pilots welcomed its other advanced systems, including its navigation computer and associated INS. 'One really good feature with the INS was true track mode', recalled Gen Dailey. 'There is zero magnetic variation in Vietnam, which helped. There was no difference between magnetic and true courses. We often had targets that were a long way from the coast, but the only way we found them was by coasting in using true ground track. There were no landmarks, and the maps were so bad that you couldn't even figure out where the river bends were. Most of the charts were 1:50,000 and we would carry a whole armload of maps.

'They'd give you a series of missions, which could be a single target or a "strip" of them, and you had to find out what the weather was like in order to work out which ones you could get coverage of before you ran out of film. We'd just keep going if we covered the targets and still had film to spare. We could refuel in flight, and there would always be a tanker waiting. It wasn't unusual to complete 25 or 30 missions on one flight – a mission could be just one target. Each requirement had a mission number. Part of the deal was that Seventh Air Force was "fragging" us, and our film had to go to them.'

The 'single manager' concept, combined with weather restrictions, produced a complex pattern of missions in order to satisfy both Marine Corps and Seventh Air Force requirements. In April, 1970, for example,

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VMCJ-1 planned 259 photo missions. Of these, 80 were cancelled due to weather and 36 through aircraft unavailability. Five were transferred back to the Seventh Air Force roster, leaving 105 to actually be flown by III MAF, including one per day to support MAG-11 *Night Commando Hunt* kills in collaboration with USAF aircraft over Laos. A further 45 were available for Seventh Air Force 'frags'. In all, 350 targets were covered including nine with IR and just two with SLAR. All this was accomplished with an average daily total of four RF-4Bs. On 1 April, nine sorties, averaging two hours each, were flown.

A helpful innovation was a daily quick reaction mission for the 1st Marine Division, covering up to ten targets and supplying prints and data within 12 hours of landing. One such mission, 'Pigment 50' (Seventh Air Force replaced the squadron's World War 1-vintage 'Cottonpicker' call-signs with 'Pigment', the former nickname being transferred to a USAF unit instead), saw the film processed within 30 minutes of landing and the resulting prints studied by III MAF interpreters with the RF-4B crew present. The squadron also developed a method of 'hot-downloading' film from the RF-4Bs' camera bays with engines running before the aircraft returned to their revetments.

Maj Gen Norman Anderson, commanding the 1st MAW in 1968, felt that VMCJ-1's reconnaissance capability was generally sidelined by the Seventh Air Force, and saw its wish to manage all such data via Seventh Air Force HQ in Saigon as detrimental to Marine Corps requirements. Rather than receiving instant feedback from RF-4B missions, the Marines usually had to wait up to three days for the material to pass through the system in Saigon, by which time it was useless.

Col Robert Lewis, VMCJ-1's commander in 1968, said that Seventh Air Force 'didn't understand that immediate photos were required if effective CAS was to happen'. He explained that during the early stages of the Khe Sanh operation, 'we would make a low-level run on the airfield perimeter once an hour, have the film to our photo interpreters 20 minutes later and immediately advise the 26th Marines Intel Section at Khe Sanh what the threat had been 30 minutes before. You can't do that with two-day tasking'.

Sometimes the squadron put fresh negatives in a courier helicopter for III MAF Intel to see and advise ground units what they revealed, and

'Golden Hawks' RF-4B-24-MC BuNo 153093 taxies in at Misawa AB, Japan, on 18 February 1974 (*Norman Taylor*)

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photo interpreters at Da Nang would also 'read' wet negatives shortly after an RF-4B returned from a mission. 'We would then deliver all the imagery to III MAF for further delivery to intelligence units in Vietnam, Hawaii and continental USA', Col Lewis recalled. 'What they did with those pictures we never knew. No I Corps ground units ever saw them'.

Only 36 RF-4Bs were funded in the main Marine Corps order, and another five were added (BuNos 157342 to 157346) to allow for Vietnam needs, although only 18 aircraft, all from the original production, served there with VMCJ-1. A final batch of five (BuNos 157347 to 157351) was delivered by the end of 1970, and these jets utilised the F-4D/J wing and undercarriage and featured the more rounded nose contours of late-production RF-4Cs. With so few aircraft available for such crucial tasks, it was fortunate that attrition was kept to just two combat losses and two written off in operational accidents.

The last jet downed in combat was BuNo 151976 on 18 October 1968 during a 600-knot photo run at 2100 ft over a target area north of the DMZ in weather so poor that it was the only RF-4B mission flown that day. AAA knocked out the port engine, triggering fire-warning lights in the cockpit, and hydraulic pressure began to drop. Maj J Walter Quist headed for the coast, where he and 1Lt D T Schanzenbach ejected safely, albeit with back injuries when the Phantom II began a slow but uncontrollable roll to port. RF-4Bs continued to absorb enemy fire for another 21 months before they were withdrawn, but there were no more losses.

Not all the damage originated from enemy fire. BuNo 153108 suddenly dipped its starboard wing while its crew was transferring fuel within the aircraft's fuel system. They sought a tanker when overall fuel levels dropped during the rest of the mission. The tanker's 'boomer' studied the approaching RF-4B through his rear window and pointed out that the front third of the starboard underwing tank (or 'pontoon') was missing.

In another MOREST accident, Col Dayton Robinson Jr's BuNo 153112 caught the wire after a tyre blew on takeoff. Unfortunately, the aircraft was airborne at that point and the arresting gear worked well on that occasion. The RF-4B slammed back onto the runway, collapsing the nose

During the final stages of the Vietnam War, and following the ceasefire in January 1973, VMCJ-1 remained active from Iwakuni by providing photo technicians for Seventh Fleet minesweeping operations and, from June 1973, deploying a detachment with CVW-5 aboard USS *Midway* (CVA-41). This embark coincided with a change of Modex, with BuNo 153110 becoming RM 607 rather than RM 24, and a new colour scheme from mid-1974. Carrier deployment of the VMCJ-1 detachment (Det 101) commenced on 24 April 1974, with three RF-4Bs and three EA-6As flown aboard the ship. These aircraft were in place to cover the evacuation of US personnel and dependents from South Vietnam and Cambodia after the North Vietnamese occupation in April, 1975. RM 607 is seen here with two underwing AN/ALQ-81 ECM pods (*USMC*)

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landing gear, damaging the underside of the camera bays and breaking off half of the port stabilator. As Col Robinson extricated himself from the aircraft the cockpit canopy slammed down on his shoulder, injuring his spine. Repairs to the RF-4B at North Island took 1800 man hours, and the Phantom II eventually re-entered service with VMCJ-3.

BuNo 153111, twice damaged by VC rocket attacks, sustained more severe damage on 2 June 1969 when the rear ejection seat was accidentally fired during maintenance. Repairs took it out of use for several weeks. This unfortunate Phantom II was hit again on 15 March 1970 when a tow-tractor driver who was backing up to connect a tow bar to its nose undercarriage suddenly shot backwards into the RF-4B when his foot slipped on the accelerator pedal. The aircraft's pitot tube and radome were crushed, taking it off the flightline once again. The final indignity came in May 1970 when one of the mounts from which BuNo 153111's engines were suspended on a track inside the top of the fuselage broke away, shearing off another engine mounting and damaging an oil tank, various fuel lines and the afterburner section. This aircraft was finally lost at sea off Iwakuni when it stalled whilst coming in to land aboard USS *Midway* (CVA-41) on 3 November 1974. The jet's pilot, 1Lt Paul Duncan, was not recovered.

Accidents, damage, progressive aircraft rework (PAR) at NAS Atsugi and routine maintenance inevitably cut into the availability of the nine or ten RF-4Bs that were usually theoretically on strength with VMCJ-1. In December 1969 that number was reduced to around three per day on the ramp. Even so, the 'Golden Hawks' managed to complete 133 missions in poor December weather. As the squadron neared the end of its tour the statistics became increasingly impressive. Its 25,000th combat mission was flown on 29 June 1970, and a record 751 targets, 216 of them using IR, were photographed that month in 235 sorties. Some 52,000 ft of the 310,245 ft of film exposed was colour – also a big increase. As usual, poor weather was the main reason why missions were either cancelled or only partially completed.

VMCJ-1's combat operations ended on 1 July 1970 as part of the general forces withdrawal from Vietnam, the squadron being reassigned to MAG-12 at MCAS Iwakuni, with detachments flying from NAS Cubi Point. When the North Vietnamese invasion began in the spring of 1972 the squadron's EA-6As were heavily involved, but the RF-4Bs surprisingly remained in Japan. Instead, the Phantom II component was directed to develop training routes over the Republic of Korea, but on 24 April it began to deploy sea-going detachments (Det 101), including EA-6As, with CVW-5 aboard *Midway* – the first use of the RF-4B as part of a carrier air wing.

Three aircraft of each type were normally embarked, and the detachment participated in numerous exercises in 1974-75 and in the final stages of the Vietnam conflict – the evacuation of US citizens and some ARVN personnel from Saigon as a tidal wave of North Vietnamese troops broke the 1973 Peace Agreement and took over South Vietnam. VMCJ-1's EA-6As also cross-decked to USS *Coral Sea* (CVA-43) to provide ECM coverage over Saigon, with an Intruder airborne over the city at all times. Lt Col William Bloomer kept two RF-4Bs ready in *Midway's* hangar deck, although they were not used in the operation, codenamed *Frequent Wind*.

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APPENDICES

US MARINE CORPS F-4 PHANTOM II UNIT DEPLOYMENTS TO SOUTHEAST ASIA 1964-73 (IN CHRONOLOGICAL ORDER)

VMFA-531 'Gray Ghosts'
(F-4B, code EC) – to MAG-16 at Da Nang from NAS Atsugi on 10 April 1965. Reassigned to MCAS Cherry Point on 15 June 1965. (aircraft lost – 0)

VMCJ-1 'Golden Hawks'
(RF-4B, code RM) – to MAG-16 at Da Nang from MCAS Iwakuni on 16 April 1965. Reassigned to MAG-11 at Da Nang on 14 July, 1965. Reassigned to MAG-15 at MCAS Iwakuni on 14 July 1970. Also operated RF-8A Crusaders, EF-10B Skyknights and EA-6A 'Electric Intruders'. (RF-4Bs lost – 4)

VMFA-513 'Flying Nightmares'
(F-4B, code WF) – to MAG-16 at Da Nang on 15 June 1965 (MAG-11 from 14 July 1965). Reassigned to MCAS Cherry Point on 14 October 1965. (aircraft lost – 0)

VMFA-542 'Bengals'
(F-4B, code WH) – to MAG-16 at Da Nang on 10 July 1965 (MAG-11 from 14 July) until 3 December 1965, then returned to MCAS Iwakuni. Reassigned to Da Nang (MAG-11) on 1 March 1966 until 1 August 1966, returning to MCAS Iwakuni and reassignment to MAG-15 on 15 August 1966. Reassigned to MAG-13 at Chu Lai on 10 October 1966 until 15 November 1967, then returned to MAG-15 at MCAS Iwakuni. Reassigned to Da Nang (MAG-11) on 10 May 1968, then to MCAS El Toro (3rd MAW) on 31 January, 1970. (aircraft lost – 12)

VMFA-115 'Silver Eagles'
(F-4B, code VE) – to MAG-11 at Da Nang on 15 October 1965, then reassigned to MAG-13 at MCAS Iwakuni on 13 January 1966. Reassigned to Da Nang (MAG-11) on 11 April 1966, then returned to MAG-15 at MCAS Iwakuni on 15 February 1967. Reassigned to MAG-13 at Chu Lai on 14 May 1967, then reassigned to MAG-11 at Da Nang on 24 August 1970. Reassigned to MAG-15 at MCAS Iwakuni on 1 March 1971 and deployed to Da Nang on 6 April 1972. Moved to Nam Phong on 16 June 1972, then to Naha (MAG-15) on 31 August 1973. (aircraft lost – 23)

VMFA-323 'Death Rattlers'
(F-4B, code WS) – to MAG-11 at Da Nang on 1 December, 1965. TDY to Tainan on 1 March 1966. Reassigned to MAG-15 at MCAS Iwakuni on 24 June 1966. To Da Nang (MAG-11) on 5 July 1966, then to Chu Lai (MAG-13) on 6 October 1966. Returned to MCAS Iwakuni (MAG-15) on 15 May 1967, then reassigned to Chu Lai (MAG-13) on 16 August 1967. Reassigned to MAG-33 at MCAS El Toro on 25 March 1969. (aircraft lost – 11)

VMFA-314 'Black Knights'
(F-4B, code VW) – to MAG-11 at Da Nang on 15 January 1966. Reassigned to MAG-13 at MCAS Iwakuni on 14 April 1966. Returned to Da Nang on 1 August 1966, then to Chu Lai (MAG-13) on 25 September, 1966. Reassigned to MAG-15 at MCAS Iwakuni on 16 August 1967, then to Chu Lai (MAG-13) on 16 November 1967. Reassigned to 3rd MAW at MCAS El Toro on 12 September 1970. (aircraft lost – 24)

VMFA-122 'Crusaders'
(F-4B, code DC) – to MAG-11 at Da Nang on 1 September 1967. Reassigned to MCAS Iwakuni on 30 August 1968. To Chu Lai (MAG-13) on 5 September 1969. Reassigned to MCAS Kaneohe Bay on 8 September 1970. (aircraft lost – 13)

VMFA-334 'Falcons'
(F-4J, code WU) – to MAG-11 at Da Nang on 30 August 1968, then to Chu Lai (MAG-13) on 24 January 1969. Reassigned to MAG-15 at MCAS Iwakuni on 30 August 1969. (aircraft lost – 5)

VMFA-232 'Red Devils'
(F-4J, code WT) – to MAG-13 at Chu Lai on 21 March 1969. Reassigned to MAG-15 at MCAS Iwakuni on 7 September 1969. To Da Nang (MAG-15) on 6 April 1972, moving to Nam Phong on 20 June 1972. To Cubi Point on 1 September 1973. (aircraft lost – 5)

VMFA-212 'Lancers'
(F-4J, code WD) – to MAG-15 at Da Nang on 14 April 1972, returning to MCAS Kaneohe Bay on 20 June 1972. (aircraft lost – 2)

VMFA-333 'Shamrocks'
(F-4J, code DN but used CVW-8 modex AJ) – deployed aboard USS *America* (CVA-66) for its third and final combat cruise from 5 June 1972 to 24 March 1973 (on station with Seventh Fleet in Gulf of Tonkin from 1 July 1972 to 4 March 1973). (aircraft lost – 3)

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COLOUR PLATES

1

F-4B-13-MC BuNo 150470/WF 7 of VMF(AW)-513, MCAS El Toro, California, April 1963

The early markings worn by this F-4B pre-date the change to VMFA (fighter-attack) designation for Marine Corps F-4B units in August 1963, and also the squadron's only deployment to Da Nang on 15 June 1965. BuNo 150470 was later transferred to VMFA-323, and whilst serving with this unit on 15 July 1966 it became the only Marine Corps loss during the 1677 'Marine Air' sorties of Operation *Hastings* – a massive search and destroy venture just south of the DMZ. Maj B Fritsch and 1Lt C Smith ejected when the aircraft was hit by AAA on its second napalm pass. Both men were quickly rescued by a USAF helicopter.

2

F-4B-18-MC BuNo 151456/EC 7 of VMFA-531, Da Nang, South Vietnam, April 1965

As the first Marine Corps Phantom II unit to be sent to South Vietnam in April 1965, the 'Gray Ghosts' pioneered many tactics for subsequent F-4 deployments. This aircraft carries AIM-7 and AIM-9B missiles, typifying the air defence role for which the squadron was initially sent to Da Nang. Reworked as an F-4N-14-MC in May 1974, the aircraft was withdrawn from use on 7 September 1983.

3

F-4B-23-MC BuNo 152274/VW 5 of VMFA-314, Da Nang, South Vietnam, March 1966

Sometimes nicknamed the 'Volkswagen squadron', VMFA-314 made three deployments to Da Nang and Chu Lai. One of 24 aircraft that the unit lost during the Vietnam War, VW 5 was the sixth, and final, loss of the squadron's early 1966 tour. Unusually, it was being flown by its assigned crew, Maj E C Paige and WO D D Redmond, when it was hit during a *Steel Tiger* mission near Hue. Like many similar aircraft, it was struck by AAA at a vulnerable stage in the mission – climbing away from ordnance delivery. The crew spent the night of 14 March 1966 evading capture in Laos, before a USAF helicopter rescued them the following day. VW 5's light load of 250-lb World War 2-vintage bombs indicates the shortage of ordnance as production strove to match the huge tonnage required with the escalation of the conflict in early 1966. The jet is also carrying Zuni rocket pods, which proved to be particularly effective against anti-aircraft fire.

4

F-4B-22-MC BuNo 152259/VE 7 of VMFA-115, Da Nang, South Vietnam, April 1966

By the spring of 1966 Da Nang-based F-4Bs carried air-to-air missiles less often, unless they were assigned 'hot pad' air defence duty. Following its service in Vietnam, BuNo 152259 went through the 'Project Bee-line' conversion process in which 227 F-4Bs were re-worked as F-4Ns from June 1972. It was withdrawn from service in September 1983.

5

F-4B-16-MC BuNo 151417/WH 9 of VMFA-542, Da Nang, South Vietnam, May 1966

The combined effects of climate and constant combat, with up to three missions a day for each available F-4B, soon degraded the paint despite the maintainers' best efforts. This 30-month old F-4B, seen with M117 'blast' bombs from USAF stocks at Da Nang, survived several small-arms hits, including damage to its lower fuselage on 18 May 1966. Converted into an F-4N post-war, BuNo 151417 was eventually retired on 24 February 1984.

6

F-4B-21-MC BuNo 152238/WH 1 of VMFA-542, Da Nang, South Vietnam, July 1966

The squadron had three 'Tiger Lead' commanders during its two deployments to South Vietnam in 1966 – Majs Eddie Pearcy and Paul Frapollo and Lt Col Donald May. WH 1 was the boss's Phantom II throughout this period, hence the fact it has more than 100 mission markings on its intake ramp. Transferred to VMFA-323 the following year, the jet was mortally hit by AAA over the DMZ on its second pass on 8 September 1967. Maj J B Caskey followed the standard procedure in heading out to sea, where, following ejection, he and RIO Capt R L Drage were pulled to safety by a USAF helicopter.

7

F-4B-10-MC BuNo 149440/VW 9 of VMFA-314, Chu Lai, South Vietnam, November 1966

Built as an F4H-1 in March 1962, this aircraft saw considerable combat with VMFA-314 in 1966-67. VW 9 was subsequently transferred to VMFA-122, and on 3 December 1967 it ran off the Da Nang runway after a tyre burst on takeoff. The jet's crew escaped injury, despite the wrecked F-4B's ruptured drop tanks and live ordnance. There were enquiries made into the quality of tyres being supplied by a major US manufacturer following several similar incidents around this time that had seen tyres disintegrating after only three or four landings.

8

F-4B-9-MC BuNo 149420/VW 5 of VMFA-314, Chu Lai, South Vietnam, November 1966

Marine Corps Phantom IIs were sent to Cubi Point to be fitted with Sanders ECM equipment under 'Project Shoehorn'. VW 5, built as an F4H-1, has one of several resultant antenna configurations (note modified fin tip, spine and radome bullet). Many early 1962-vintage F-4Bs such as BuNo 149420 served throughout the war in Marine Corps and US Navy squadrons. A veteran of myriad combat missions, this aircraft survived until 18 August 1979, when it was destroyed as a QF-4B target drone.

9

F-4B-22-MC BuNo 152258/WS 11 of VMFA-323, Chu Lai, South Vietnam, December 1966

This squadron exchanged its F-8E Crusaders for F-4B Phantom IIs in August 1964, deploying to Da Nang in December 1965 for the first of three tours. WS 11, displaying a variant of the squadron's rattlesnake décor on its tail, was hit only once by small-arms fire in September 1966. It survived the conflict to become an F-4N post-war, but met its end as a QF-4N drone.

10

F-4B-22-MC BuNo 152260/WH 1 of VMFA-542, Chu Lai, South Vietnam, June 1967

Decorated in the more subdued 'Bengals' markings of 1967-68, WH 1 also has the interim AN/APR-24 RHAW fit. This

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equipment was installed in several F-4Bs in late 1966, and it was progressively replaced by APR-30, APR-25 and APR-27, all with slightly different antennas. BuNo 152260 was subsequently transferred to VMFA-115 and was hit on its second napalm pass against enemy troops near Hué on 22 January 1969. 1Lts W E Collins and Daniel Minahan ejected close to the target, and the rescue helicopter found the pilot badly injured and his RIO dead.

11

F-4B-11-MC BuNo 149452/WS 17 of VMFA-323, Chu Lai, South Vietnam, February 1968

This Phantom II was acquired by VMFA-323 from VMFA-314 in exchange for BuNo 152236 on 16 November 1967. Originally flown as WS 02, it received AAA damage in February 1968 and, in a further exchange, it was passed to CVW-2 embarked in USS *Ranger* (CV-61) on 1 July 1968. F-4B/Js were delivered with either black or white radomes, and replacements due to damage or wear could be of either colour. Many squadrons favoured white, although black radomes had the best 'radar transparency' qualities in the early 1960s.

12

F-4B-16-MC BuNo 151407/DC 1 of VMFA-122, Da Nang, South Vietnam, January 1968

The Mk 4 HIPEG gun pod (mounted on the centreline stores station) was a useful weapon, although it tended to jam easily. The cannon could be used to keep enemy gunners' heads down prior to dropping the widely used Mk 82 SE Snakeye bombs also loaded on DC 1. This aircraft was destroyed in a VC rocket attack on Da Nang on 30 January 1968.

13

F-4B-15-MC BuNo 151013/WS-11 of VMFA-323, Chu Lai, South Vietnam, February 1968

This battle-worn Phantom II received small-arms damage three times in January and twice in February 1968. It also flew with VMFA-314 as VW 16, but it was shot down by a SAM on 27 August 1972 whilst flying from the carrier *Midway* after it had been transferred to VF-151.

14

F-4B-21-MC BuNo 152243/VW 13 of VMFA-314, Chu Lai, South Vietnam, September 1968

The battle-worn radome of this aircraft was typical of VMFA-314's jets at this time, the unit's Phantom IIs averaging 66 sorties per month. Maj Carl Black and 1Lt Bob Schmitt flew the squadron's 6000th combat sortie in this aircraft on 29 September 1968. Converted into an F-4N post-war, this aircraft was retired in August 1982.

15

F-4J-34-MC BuNo 155738/WU 9 of VMFA-334, Da Nang, South Vietnam, 27 October 1968

This representative of the first Marine Corps F-4J-equipped unit in combat carries typical 'snake and nape' ordnance. It took small-arms hits in the stabilator on 9 September 1968 and a 0.50-cal hit on 27 October that caused utility hydraulic failure. When Lt Col Stewart and 1Lt B K Yorkoff attempted a BAK-12 arrested landing at the end of the mission, the cable failed to stop the aircraft from departing the runway and coming to rest on its left wing tank after the left landing gear had collapsed. Once repaired, the aircraft moved to VF-92 aboard *America*, and it was lost on 20 May 1970 in the week prior to the vessel entering combat with Task Force (TF) 77 off Vietnam. Both crewmen ejected when the jet suffered an in-flight control failure.

16

F-4J-34-MC BuNo 155735/WU 6 of VMFA-334, Da Nang, South Vietnam, November 1968

This F-4J was used by Maj H J Bond and Capt Len J Catanzaro for the first data-link flight with the Marine Corps' MACS-4 tactical data system in Vietnam on 13 November 1968, and by Lt Col Jim Sherman (squadron CO) with Capt Catanzaro on a 24 November Ho Chi Minh Trail interdiction that suppressed two AAA positions and destroyed eight trucks. A repeat attack a few hours later took out more AAA and destroyed road-building equipment. WU 6 absorbed several small-arms hits during its tour, including one that impacted the pilot's seat on 17 March 1969. Converted into an F-4S in 1981, the jet was retired in December 1984.

17

F-4B-14-MC BuNo 150484/VE 10 of VMFA-115, Chu Lai, South Vietnam, December 1968

This aircraft was one of twelve data-link, remote-intercept equipped F-4Gs used in combat by the US Navy's VF-213 in 1965-66, of which seven were returned to F-4B standard in October 1967. It was later upgraded into an F-4N, serving until September 1981. Its *Chevas Regal* nickname (often misspelled so as not to infringe the copyright of a famous Scottish beverage) may have derived from a series of TF 77 strikes of that name, supported by both VMFA-115 and VMCJ-1. The nicknames worn by 'Silver Eagles" F-4Bs included VE 00 *Joker*, VE 2 *Exterminator*, VE 11 *Night Train* and VE 17 *Chaos*.

18

F-4J-30-MC BuNo 155819/WT 3 of VMFA-232, Chu Lai, South Vietnam, April 1969

The Mk 20 Rockeye CBUs and Zuni rocket pods carried by this aircraft were particularly effective against motor transport and AAA. BuNo 155819 was passed on to VMFA-212 in early 1972, and on 4 June it had the misfortune of being the second, and last, F-4 lost by the unit during its brief stay at Da Nang. Struck by AAA whilst attacking enemy troops near Phu Cat, the aircraft crashed moments later, killing Capt B L Tebault and 1Lt M J Konow.

19

F-4J-30-MC BuNo 153822/WT 13 of VMFA-232, Chu Lai, South Vietnam, April 1969

VMFA-232 had deployed to Chu Lai in March 1969, some 15 months after delivery of its initial F-4J complement. Following the unit's reassignment to Iwakuni in September 1969, BuNo 153822 was transferred to VMFA-235 at Kaneohe Bay, where it was lost in an unrecoverable spin during ACM training on 12 July 1972 (both crewmen successfully ejected).

20

F-4B-15-MC BuNo 151454/DC 5 of VMFA-122, Chu Lai, South Vietnam, October 1969

Flown by 1Lts Robert Bradshaw and Michael Breeding as 'Lovebug 225' on a 12 February 1970 TPQ at 290 knots and 19,000 ft, this F-4B suddenly passed overhead its flight leader inverted. Bradshaw radioed 'It's okay, we're alright', but no more was heard of the crew, and their fate remains a mystery to this day.

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21

F-4B-17-MC 151446/VE 11 of VMFA-115, Da Nang, South Vietnam, January 1971

VMFA-115 was the Marine Corps' longest-serving wartime F-4 squadron, deploying five times between October 1965 and August 1973. *Night Train* has the revised colour scheme that adorned the unit's aircraft when they moved to Nam Phong, Thailand, in June 1972. Converted to F-4N standard in January 1976, BuNo 151446 served until November 1983.

22

F-4B-18-MC BuNo 151465/DC 1 of VMFA-122, Iwakuni, July 1972

This aircraft was assigned to Col R E Johnson, 'Crusader Lead', who explained 'I took command of VMFA-122 in May 1972 at Iwakuni. It was unclear at the time how long we were going to be there, or which way we would be going. This was a time when things began to heat up a bit in Vietnam. Prior to our return to Kaneohe in September 1972 my Maintenance Officer, Maj John Dempsey, approached me with an idea for a new paint scheme, extending the black, grey and white over the radome. I thought it looked great and said, "Do it". The idea seemed to quickly gain fleet approval, as most Navy and Marine F-4s of that vintage began sporting similar schemes. It all started from John's idea, and our squadron was the first'.

23

F-4J-31-MC BuNo 153847/WD 7 of VMFA-212, Da Nang, South Vietnam, May 1972

The 'Lancers" first combat deployment was in 1965 with F-8E Crusaders, and its brief Da Nang F-4J deployment in 1972 was in response to the Spring Invasion by North Vietnam. Upgraded into an F-4S in March 1980, BuNo 153847 was eventually retired on 28 May 1986.

24

F-4J-32-MC BuNo 153877/AJ 207 of VMFA-333, USS *America* (CVA-66), August 1972

The 'Shamrocks' (or 'Trip Trey') shared fighter duties with US Navy F-4J squadron VF-74 within CVW-8 during CVA-66's 1972-73 combat cruise with TF 77. This was the first time a Marine Corps Phantom II unit had embarked aboard a carrier for a sustained period of time, this particular cruise having started as a routine Mediterranean deployment in June 1972. CVA-66 was then 'chopped' from Sixth Fleet to Seventh Fleet control on 1 July for 158 days of combat duty. BuNo 153877 was converted into an F-4S in 1981 and retired from service several years later.

25

F-4J-35-MC BuNo 155806/WT 16 of VMFA-232, Nam Phong, Thailand, September 1972

The North Vietnamese Spring invasion of 1972 took the 'Red Devils' from Iwakuni to Da Nang on 6 April and from there to Nam Phong on 20 June. WT 16 was one of 19 F-4Js that flew air-to-air BARCAP and air-to-ground sorties against targets with unprecedented AAA protection. Zuni and Rockeye were considered the most effective weapons for the latter. The aircraft joined the F-4S conversion programme in 1982, retiring in April 1989.

26

F-4J-33-MC BuNo 155526/AJ 201 of VMFA-333, USS *America* (CVA-66), September 1972

Although 'Shamrock 201' was assigned to the squadron commander, Lt Col John Cochran, and Maj Hank Carr, on 10 September 1972 it was flown by Maj Lee 'Bear' Lasseter and Capt John Cummings on a MiGCAP over Phuc Yen airfield, North Vietnam. During the course of the mission this crew achieved the only all-Marines MiG kill of the war – they were also credited with a 'probable' MiG-21. AJ 201, first flown on 4 January 1968, was hit by a SAM as it returned from the mission, and its crew survived a hazardous ejection. Lee Lasseter took over the squadron after Lt Col Cochran was injured in an ejection on a 23 December reconnaissance escort mission.

27

RF-4B-26-MC BuNo 153101/RM 15 of VMCJ-1, Da Nang, South Vietnam, December 1966

VMCJ-1 flew its first combat sorties from Da Nang in October 1966 – a little over 18 months after the first flight of the prototype RF-4B. RM 15 was in the initial batch of aircraft to arrive at Da Nang from Japan on 28 October, and it survived 44 months of intensive combat use, suffering only minor AAA damage to its radar in June 1970. The jet also endured a MOREST landing following a hydraulic pressure drop in May 1970. BuNo 153101's final service was with VMFP-3 at MCAS El Toro, including a NATO deployment to Denmark in 1979. On 22 May 1981 it crashed into a canyon wall near Ely, Nevada, after the controls apparently jammed – the crew perished in the accident. On 25 April 1980 the jet had survived a mid-air collision in cloud with the first RF-4B, BuNo 151975, near Mesquite, Texas. Although the latter aircraft was destroyed, its crew (VMFP-3's CO, Lt Col Burton Sperry, and the unit's final commander-to-be, Capt Michael S Fagan) successfully ejected.

28

RF-4B-27-MC BuNo 153109/RM 33 of VMCJ-1, Da Nang, South Vietnam, February 1967

Also part of the 28 October 1966 deployment to Da Nang, RM 33 (also RM 22) has its first ten missions marked up on its intake ramp. The jet took a small-arms hit in the wing in December 1966, and more severe damage from 0.50-cal hits in its wing, stabilator and engine bay during a hazardous 'mosaic' photo-mapping mission on 29 March 1970.

29

RF-4B-27-MC BuNo 153110/RM 24 of VMCJ-1, Da Nang, South Vietnam, March 1968

This RF-4B, seen here with AN/APR-30 RHAW antennas on its fin cap, flew with VMCJ-1 for seven years before returning to VMCJ-3. The aircraft completed its career with VMFP-3 in 1989, having by then completed 5500 flying hours.

30

RF-4B-27-MC BuNo 153109/RM 614 of VMCJ-1, USS *Midway* (CVA-41), August 1975

Seen here later in its combat career, and with the squadron's revised colour scheme, BuNo 153109 was part of Det 101 assigned to CVW-5. *Midway's* aircraft provided cover for the evacuation of US personnel from Saigon in Operation *Frequent Wind*. Transferred to VMFP-3 in March 1976 and upgraded as part of the SURE Block 4 rework, this aircraft was finally lost on 27 October 1987 during a *Cope Thunder* exercise in the Philippines when a photo-flare cartridge failed to eject and exploded in the rear-fuselage flare dispenser, causing a major fire. Capt Huey Moser and 1Lt Andrew Auer successfully ejected over the Crow Valley weapons range.

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Front Cover
During a typical low-altitude napalm delivery on 8 February 1970, Maj J B Leonard and 1Lt J C Coon of VMFA-314 hit North Vietnamese Army troops near Duc Pho, close to Route 1A and 40 miles southeast of Chu Lai. During one pass a napalm canister under the jet's port wing suddenly started to burn, possibly because of a hit on its magnesium igniter by the 0.50-cal AAA batteries or small-arms fire in the area. When the port wing of the crew's F-4B-11-MC (BuNo 149467) caught fire Maj Leonard coaxed the aircraft out over the coast and the crew ejected 25 miles southeast of Da Nang. They were quickly rescued by helicopter, having suffered only minor injuries in the ejection process.

There were several cases of napalm canisters igniting prematurely, causing damage to aircraft. Nevertheless, the weapon was highly valued as a deterrent to enemy forces in close contact with Marines on the ground, even though the low-altitude delivery required to place it accurately put the crew at greater risk to enemy ground fire than a bombing pass at higher altitude *(Cover artwork by Gareth Hector)*

First published in Great Britain in 2012 by Osprey Publishing
Midland House, West Way, Botley, Oxford, OX2 0PH
44-02 23rd Street, Suite 219, Long Island City, NY, 11101, USA

E-mail: info@ospreypublishing.com
Osprey Publishing is part of the Osprey Group
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A CIP catalogue record for this book is available from the British Library

ISBN: 978 1 84908 751 3
PDF e-book ISBN: 978 1 84908 752 0
ePub ISBN: 978 1 78200 312 0
Edited by Tony Holmes
Cover Artwork by Gareth Hector
Aircraft Profiles by Jim Laurier
Index by Alan Thatcher
Originated by PDQ Digital Media Solutions, UK
Printed in China through Bookbuilders

12 13 14 15 16 10 9 8 7 6 5 4 3 2 1
Osprey Publishing is supporting the Woodland Trust, the UK's leading woodland conservation charity, by funding the dedication of trees.
www.ospreypublishing.com
Acknowledgements
The author would like to express particular gratitude to Cdr Peter Mersky USNR (Ret) for his unfailing help with this book, and to Col Denis J Kiely USMC (Ret) and Maj Gen Hal Vincent USMC (Ret). Thanks are also due to Col John D Cummings USMC (Ret), Gen John R Daily USMC (Ret), Director, Smithsonian Institution, Capt Thomas H Idema USMC (Ret), Col Robert C Johnson USMC (Ret), Lt Col T J Lyman USMC (Ret), Col Jacques Naviaux USMC (Ret) (for permission to use extracts from his unpublished war memoirs) and Gen William L 'Spider' Nyland USMC (Ret)
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